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INDUSTRIAL MEDICINE

The Journal of Occupational Diseases
and Traumatic Surgery

February, 1941

Plastic Surgery and Repair
— Uses of, and Indications for, Skin Grafts —

Maxillo-Facial Injuries
— Important Considerations —

Physical Therapy
— Indications and Limitations in Railroad Surgery —

Neurosurgical Lesions
— Those Producing Pain in the Back —

The Medical Department
— Importance in Industry —

Head Injuries
— Certain Principles of Treatment —

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Volume 10 Number 2

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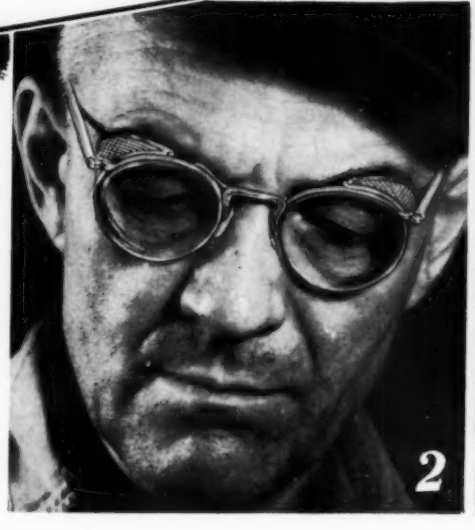

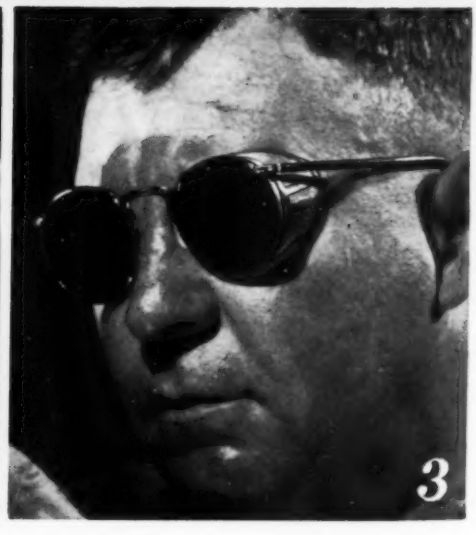

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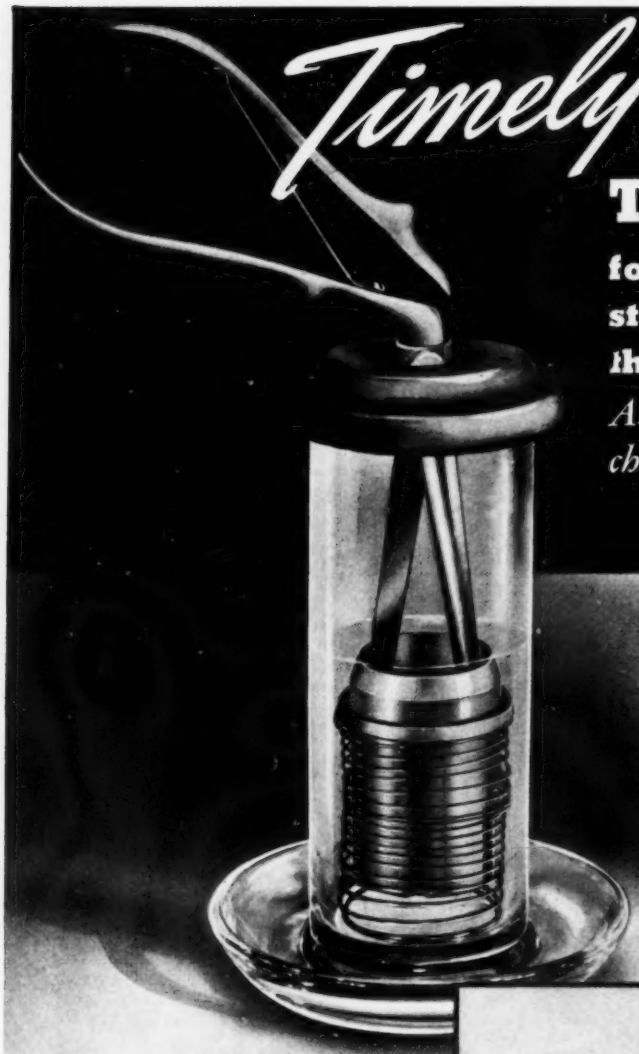

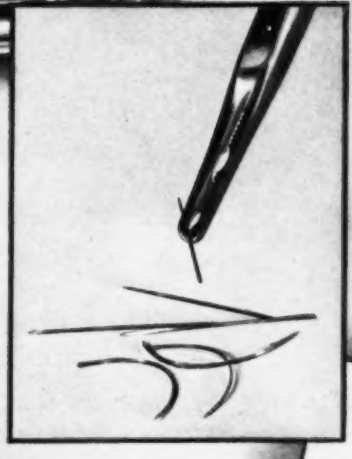

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AMERICAN ASSOCIATION of Industrial Physicians and Surgeons
Twenty-Sixth Annual Meeting
and
AMERICAN INDUSTRIAL HYGIENE ASSOCIATION
Second Annual Meeting
Pittsburgh, Pennsylvania,
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DR. MASON'S "Plastic Surgery and Repair" (page 47), with particular reference to the hand, and confined, as he notes, to "the uses of and indications for skin grafts," is illuminating and authoritative. DR. MASON participated in the Symposium on Hand Injuries at the Third Annual Congress on Industrial Health, held last month at Chicago. DR. IVORY'S "Important Considerations in Maxillo-Facial Injuries" page 52), written especially for INDUSTRIAL MEDICINE, was prompted by "some of the poor results observed in 17 years of hospital experience." DR. IVORY is Oral Surgeon (Attending, Visiting or Consulting) for seven Staten Island hospitals, was Adjunct Assistant Visiting Surgeon, 4th Division, Department of Oral Surgery, Bellevue Hospital, New York City, 1929-1932, and is Lieutenant Commander, DC-V(S), U.S. Naval Reserve. From this background he knows first hand the importance of the "close cooperation" he urges "between the oral and general surgeons in all injuries of the face and jaws." DR. HANSSON'S "Physical Therapy" (page 54), and DR. DAVIS' "Neurosurgical Lesions" (page 55), are from the Fifty-First Annual Meeting of the AMERICAN ASSOCIATION OF RAILWAY SURGEONS; and, following them (page 58) is "Importance of a Medical Department in Industry," by W. M. JEFFERS, Union Pacific Railroad's capable president, from the same meeting. MR. JEFFERS, characteristically frank and fair, gives the doctors in industry credit for a vision which—in so far as

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Official Publication

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Semi-Annual Dinner: May 22. Annual Dinner: November 20.
Annual Meeting and Election of Officers: December 18.

—*Continued from Page 3.*

it is possessed by the one and not by the other — may be an important point of distinction between the industrial physician and the non-industrial physician. He says: "I hesitate to believe that industry in its first appraisement of the value of providing medical treatment of employees, projected the resulting benefits further than those immediately in sight. Those physicians and surgeons who became actively engaged in the work soon began to visualize other economic benefits." THEN follow more of the papers from the Railway Surgeons' program, carrying over to the printed pages all the qualities of excellence that made them so interesting and instructive to those who heard them read. DR. WOLFER'S "Tumors of the Head, Face and Neck" (page 59), is a terse epitome of experiences with a truly "tremendous" subject. The author's treatment is a model of the concise style which, as Dr. Johnson says, "expresseth not enough, but leaveth somewhat to the understanding," The brevity, however, is inversely proportional to the authoritativeness. And DR. VORIS' "The Management of Head Injuries" (page 60) is equally compact, interesting, and important.

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THE digest of the proceedings of the Annual Winter Clinical Session of the CENTRAL STATES SOCIETY OF INDUSTRIAL MEDICINE AND SURGERY (page 64), is, as such things go, unusually informative. The article following it, "The Industrial Nurse", by RUTH HOULTON, R.N., (page 67) is also a digest—of her paper given at the Symposium on "Availability of Trained Industrial Health Personnel" at the recent Third Annual Congress on Indus-

—*Continued on Page 7.*

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—*Continued from Page 5.*

trial Health, Monday, January 13, 1941. AND then there are certain proposed amendments of the Constitution and By-Laws of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, to be voted upon at the Twenty-Sixth Annual Meeting in Pittsburgh, May 5-9, 1941.

DR. NOLAND'S "Status and Function of the Industrial Physician" (page 72) is from *J. M. A. Georgia.* If this is typical of the kind of articles the A. M. A. Council on Industrial Health has in mind when it refers now and then to the increasing number of articles on industrial medicine planned to appear in the various state journals, the more the better. It is the non-industrial men who need such articles, and it is the industrial men who can best prepare them. For such of the latter as may have an assignment of this kind in prospect, DR. NOLAND'S presentation is an excellent model.

DR. CONZETT'S "Management of Minor Industrial Injuries" (page 75), from *J. Iowa State Med. Soc.*, gives a clear picture of compensation practice in a predominantly agricultural state, and makes a plea for more careful attention on the part of physicians and surgeons in every state to the matter of careful and proper records.

IT IS hoped that MISS HELEN L. BYRNES, whose "Relation Between Corrosion and Menstruation" (page 80) leaves a foundling problem on the doorstep of the physiological chemists, may receive from others who have had similar or related experiences, the information which will reward her interest in her work and her enterprise in bringing this unusual phase of it to general attention. She may be addressed in care of INDUSTRIAL MEDICINE.

Industrial Medical Courses

THE prevention and control of occupational diseases in national defense industries through modern methods of industrial hygiene and industrial health education will be emphasized in a new advanced course in "Industrial Hygiene and Occupational Diseases" conducted during the spring term beginning February 3 by the New York University Center for Safety Education. Among guest lecturers: DR. LEONARD GREENBERG, New York State Department of labor; DR. A. J. LANZA, Metropolitan Life; DR. C. H. WATSON, American Telephone and Telegraph Company; HENRY D. SAYER, Compensation Insurance Rating Board; MYRON A. SNELL, Hartford Accident and Indemnity Company; WARREN A. COOK, Zurich General Accident and Liability Insurance; F. A. PATTY, Fidelity and Casualty Company of New York; J. J. BLOOMFIELD, National Institute of Health, U. S. Public Health Service; B. F. POSTMAN, Connecticut Department of Health; REUEL C. STRATTON, and J. B. FICKLER, The Travelers Insurance Company; FRED W. SEHL, Aetna Casualty and Surety Company; and DR. HERBERT J. STACK, Director of the Center. Among topics considered: The nature, incidence, and prevention of occupational diseases; factors affecting industrial health; exposures in industry; engineering control methods in occupational disease prevention; medical control and industrial health education; legal phases of occupational diseases; the classification, nature, and prevention of dust diseases; metallic poisons in industry; the effects and control of toxic gases; toxic organic solvents; dermatoses and venereal diseases; air sampling methods and

—*Continued on Page 10.*

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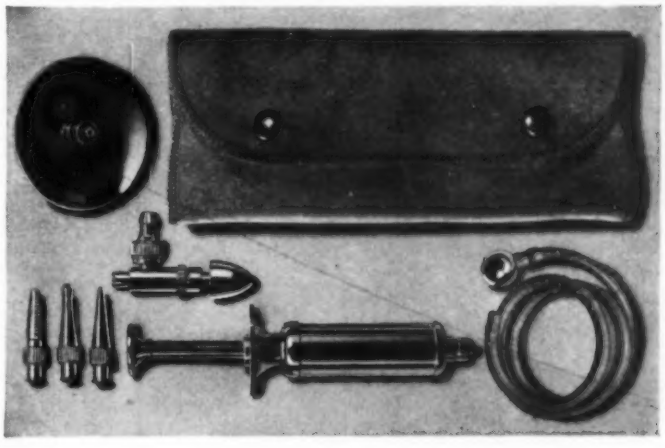

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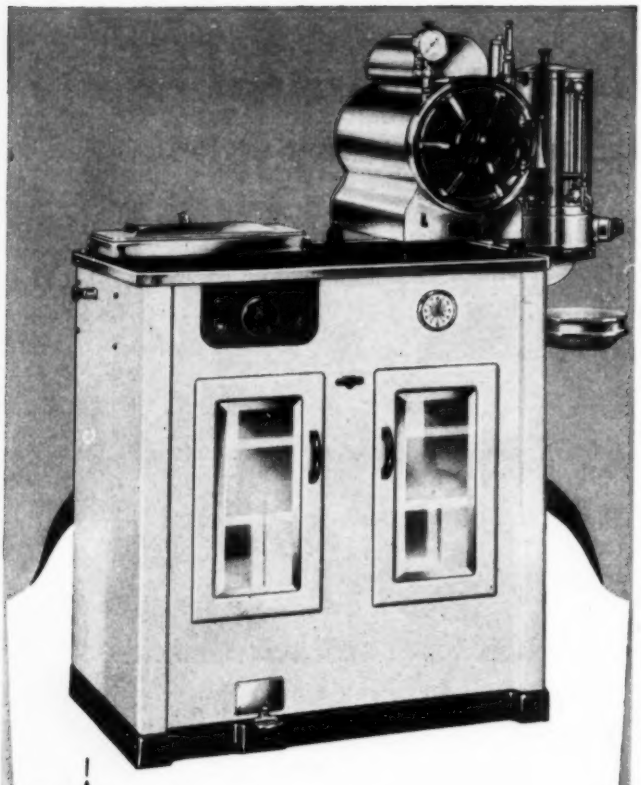

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—*Continued from Page 7.*

analyses; personal protective equipment; ventilation; and plant surveys of industrial processes and operations. Members of the class will be awarded certificates upon successfully completing the course, for which there are no formal entrance requirements.

POLYTECHNIC INSTITUTE OF BROOKLYN, Brooklyn, New York, Department of Chemical Engineering, is offering a new course in Industrial Hygiene to be given for the first time the second semester of this present year by DR. MOSKOWITZ, Senior Chemist, Division of Industrial Hygiene of the New York State Department of Labor. A study is made of toxic substances, their occurrence in industry, presence in atmospheric contamination, and estimation; as well as their recovery, removal, and prevention. Metallic and non-metallic hazardous elements and their compounds; toxic inorganic and organic gases, vapors, and dusts; organic solvents; contact irritants; and radioactive substances will be considered in relation to personal health and protection of workers, operating methods, ventilation, and control. The course will include lectures, demonstrations with modern equipment for analysis and control, selected readings, problems in design and operation, and reports on specific processes and industries.

ITEM: "The insistence of the United States Trucking corporation that a truck driver involved in five accidents in the last year have his eyes examined led to a strike of 300 union drivers last Friday, it became known today when the company filed a $100,000 damage suit against local 807 of the International Brotherhood of Teamsters, an A. F. of L. affiliate." —*Chicago Tribune.*

Institute of Industrial Medicine and Industrial Hygiene

—Annual Meetings of the American Association of Industrial Physicians and Surgeons and the American Industrial Hygiene Association, Pittsburgh, May 5-9, 1941—

THE Twenty-Sixth Annual Meeting of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, and the Second Annual Meeting of the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION, to be held at the William Penn Hotel, Pittsburgh, Pennsylvania, May 5-9, 1941, will comprise a post-graduate Institute of Industrial Medicine and Industrial Hygiene, in which engineers, physicians, surgeons and industrial hygienists will find an abundance of instructive papers and discussions on all medical and engineering phases of employee health protection. The general program, by days, is summarized as follows:

MONDAY, May 5:

A series of important dry clinics in Industrial Medicine and Surgery will be held at Pittsburgh's Mercy Hospital. JOHN P. GRIFFITH, M.D., Chairman of the hospital clinic committee and Professor of Surgery, School of Medicine, University of Pittsburgh, will be in charge. One of the high lights of the day will be a consideration of diagnosis and treatment of various "Industrial Backs"; another will be a discussion of pneumonia and its treatment with special reference to the use of some of the newer drugs, such as sulphathiazol.

TUESDAY, May 6:

The HON. CORNELIUS D. SCULLY, Mayor of Pittsburgh, will welcome the delegates. Other addresses of welcome will be made by FREDERICK JACOBS, M. D., President, Allegheny County Medical Society; and J. T. SHAW, Secretary of Health, Commonwealth of Pennsylvania. Response will be made by DANIEL L. LYNCH, M. D., President of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, and MR. WARREN COOK, President, INDUSTRIAL HYGIENE ASSOCIATION.

DR. LYNCH will make the president's address after which the following subjects will be presented and discussed:

"Practical Results of Periodic Physical Examinations," by A. J. KAMMER, M.D., Medical Director, Inland Steel Company, Indiana Harbor, Indiana.

"Relation of Trauma to Disease" by A. H. COLWELL, M. D., Associate Professor of Medicine, School of Medicine, University of Pittsburgh.

"Contact Dermatoses" by W. H. GUY, M.D., Professor of Dermatology, School of Medicine, University of Pittsburgh.

Tuesday afternoon will be devoted to presentations and discussions of "Sequelae of Head Injuries"; "Trauma Other Than Fractures"; "Mental Hygiene in Industry"; and "Evaluation of Circulatory Function in Extremities."

Individual group conferences will be held on Tuesday evening.

WEDNESDAY, May 7:

The morning will be given over to recent research on such subjects as carbon monoxide poisoning; effects of radiation from an ophthalmologic viewpoint; and various aspects of industrial lead exposures and industrial lead poisoning.

Tuberculosis problems will be the main topic of discussion in the afternoon, including engineering preventive methods in the control of tuberculosis; other methods of prevention and control; and discussions of bacteria in the air and problems of disinfection and ventilation.

A banquet will be held in the evening at which principal speakers will be DR. IRVING ABELL, Chairman of Health and Medical Committee, Federal Security Agency, discussing the role of industrial medicine and hygiene in national defense; and V. O. KNUDSEN, Dean of the Graduate School, University of California, Berkeley, speaking on "Noise and Hearing."

THURSDAY, May 8: Industrial ventilation problems will be considered. Subjects to be discussed are: control of gases, vapors and fumes; electroplating operations; air borne infections; radiant cooling; and also studies of recent dust determination methods including concentration and free silica content.

Industrial hygiene dust studies are scheduled for the afternoon. This will include investigations in the chrome brick industry; lead and zinc mining, copper refining; and Fuller's-earth as a cause of pneumoconiosis. Papers will also be read on particle sizes of dusts as found in various industries; animal and petrographic studies on talc dusts; and silicosis among naval foundry men.

Thursday evening's session includes miscellaneous subjects: a review of industrial hygiene progress during 1940; claims of industrial poisoning; medicine and engineering evaluation of exposures in the synthetic sausage and casing industry; sampling and determination of aldehydes; and the absorption and elimination of noxious vapors.

FRIDAY, May 9: The morning session includes a report on dermatitis control in a mass production industry; sporotrichosis as an occupational disease among florists; common solvent exposures; electric arc welding; gases, fumes and vapors from coated welding rods; trends in occupational disease; and eye protection in industry.

The Institute concludes its symposiums, in the afternoon, with dis-

cussions of controlled radium hazards; phosphorus toxicology; biochemistry of carbon bisulfide; new synthetic chemical; toxicity of 1-1 Dichlor-1-nitro-ethane; toxicity of methyl silicate; toxic effects of animals of methyl, ethyl, and butyl methacrylates.

American Conference on Industrial Health

AT A meeting of the Board of Directors of the AMERICAN CONFERENCE ON INDUSTRIAL HEALTH, held on Friday, February 7, the following officers of the Conference were elected for the year 1941:

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The AMERICAN CONFERENCE ON INDUSTRIAL HEALTH was recently incorporated under the laws of the State of Illinois, with the following objects and purposes: "to provide an organization, not for pecuniary profit, in which all agencies and societies, both medical and lay, concerned with the problems of industrial health can hold membership and can meet together in conference for the study, discussion and careful consideration of all industrial health problems and procedure; to engage in scientific research to determine the cause, nature, prevention and cure of diseases and injuries of occupations; to assist in establishing and supervising industrial health clinics to serve small industries, to establish and maintain hospitals which will furnish facilities for the care, treatment and study of occupational injuries and diseases; to make surveys of industrial medical services and recommendations for their improvement; to solicit, receive and administer funds for any purpose that will advance and/or improve industrial health; to establish undergraduate and/or post-graduate courses in industrial medicine and surgery and/or to cooperate with medical schools and industries in maintaining such courses; and to use all those means, which from time to time, may seem to it wise, for the advancement and improvement of industrial health."

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DR. CLAY RAY MURRAY'S paper "Correlation between Fracture Treatment and Fracture Pathology," which was presented by DR. MURRAY at the dinner in his honor given by the CENTRAL STATES SOCIETY OF INDUSTRIAL MEDICINE AND SURGERY, at the Winter Clinical Session on December 6, 1940, will be published in full text in an early issue of INDUSTRIAL MEDICINE.

A full abstract of the proceedings of the Third Annual Congress on Industrial Health will appear in INDUSTRIAL MEDICINE for March.

BEGINNING with January, 1941, INDUSTRIAL MEDICINE is indexed in INDUSTRIAL ARTS INDEX.

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Industrial Medicine

Reg. U. S. Pat. Off.

The editors will exercise care in checking on the accuracy of data printed, but in all other respects articles and opinions of which expression is allowed are the opinions of their authors—the editors reserving in all cases the right to comment on the same, in the current or any subsequent issues, as they may be inclined.

The Journal of Occupational Diseases and Traumatic Surgery

With which are consolidated "The Industrial Doctor" and "International Journal of Medicine and Surgery."

The Science, the Law and the Economics of Industrial Health

Volume 10 FEBRUARY, 1941 Number 2

Plastic Surgery and Repair

—*With Particular Reference to the Repair of Cutaneous Defects of the Hand*—

MICHAEL L. MASON, M.D., F.A.C.S.,
Chicago

IT IS difficult to define exactly the field of plastic surgery and particularly so when it is applied to the surgery of the hand. In a sense, almost any surgical procedure upon the hand is plastic surgery since there is scarcely any part of the body where failure to follow recognized surgical principles may so compromise the ultimate function. The incisions for drainage of infections must be made not only with a view to obtaining adequate drainage but also to leaving a scar which will heal without leading to sensory loss or cutaneous contracture. Granulating areas following burns, wounds, and infections should be covered as soon as the surface is clean so as to minimize not only the danger of infection but also the subsequent scarring and deformity. The acute injury requires particular care since the surgeon desires not only that the wound will heal quickly and without infection but likewise that the patient be left a useful functioning hand.

I shall not attempt to cover the whole field of plastic surgery of the hand but shall confine myself to one particular aspect of it; that is, the uses of and indications for skin grafts. We may divide the indications for the repair of cutaneous defects into three large categories depending upon the type of surface with which the surgeon has to deal; *First,* indications arising in the immediate care of open injuries in which the surgeon is confronted with an open wound which cannot be closed by suture; *second,* large granulating areas such as are left by burns and the sloughing of cutaneous tissues from injury or infection; and *third,* raw dissected areas produced surgically for various indications to be discussed more in detail later.

Department of Surgery, Northwestern University Medical School and Passavant Memorial Hospital, Chicago, Illinois. Presented at the Fifty-First Annual Meeting of the AMERICAN ASSOCIATION OF RAILWAY SURGEONS, Chicago, September 16, 1940.

Immediate Injuries

THE use of skin grafts following cleansing and debridement of the open wound is indicated when closure by suture is impossible. This presupposes, of course, that the wound has been seen sufficiently early to permit primary closure; that is, within six to eight hours. Without in any way encouraging the needless sacrifice of skin it is my feeling that the surgeon who can remove and apply a razor graft is not so likely to take chances with devitalized flaps or to try to suture skin edges under great tension across a defect. There are many reasons for obtaining primary closure of a wound, and these become the indications for primary skin grafting. The convalescence is appreciably shortened since there is not the long delay of spontaneous epithelization. The scar and contractures which follow healing of large raw granulating wounds are minimized by dressing the wound with skin and obtaining healing by primary intention. The danger of secondary infection is appreciably diminished, and the fluid losses which occur from any raw surface are immediately controlled. Postoperative dressings are reduced in number and are of no more inconvenience to the patient than the dressing of a sutured wound.

The graft most frequently applicable in the fresh injury is the thick split graft or graft of intermediate thickness which may be removed in almost any desired size. It may be used to cover small defects such as traumatic amputations of the finger tips (Fig. 1). Here, the volar surface of the forearm is a convenient donor site from which sufficient skin may be taken with a sharp scalpel. These small amputation stumps, because of the central bony core and the firmness of the tissues, can seldom be sutured and take weeks to heal if they are left open. Similarly, other small defects (Fig. 2) which the surgeon may be tempt-

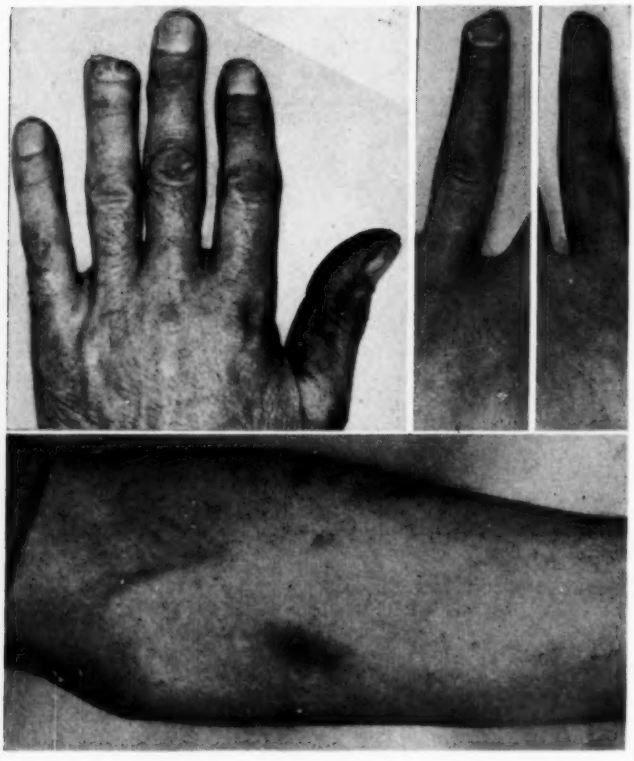

Fig. 1. Traumatic amputation of finger tip may be covered immediately with a split graft taken from volar surface of forearm

ed to close under tension or simply allow to heal without closure may be quickly dressed with a small graft and primary healing obtained.

Large areas as well may be immediately covered with a thick split graft (Fig. 3). Here, the thigh serves as donor site, and sufficient skin can be removed to cover most of the hand. This is a particularly valuable procedure when extremely large areas are denuded, and the only other recourse would be the use of a pocket flap. To leave such wounds open to granulate and become infected has no justification whatever. They must eventually be covered with skin if the hand is to be restored to use, and the quicker this skin can be applied the better.

The free full thickness or Wolfe graft is not often used in immediate injuries. It requires almost ideal conditions for growth and is best used only on freshly dissected surfaces. However, I have on occasion applied these grafts to open wounds following cleansing and wound excision and have obtained good healing. The advantage of the free full thickness graft is that the transplanted skin is thick and tough and produces an ideal surface. However, the intermediate thickness razor graft is almost as good and is more easily handled.

Pedunculated flaps are occasionally needed in the fresh wound. When bones, joints, and tendons are exposed, one can not expect the free grafts to take, and here a graft carrying its own blood supply must be used. The pedunculated flap, however, is not an easy graft to raise and adjust, and if it is to be transferred at once, it must have a generous pedicle in order that it may survive. It is preferable to raise pedunculated flaps in several stages previous to their application to permit the development of a good blood supply in the pedicle. In case of the fresh wound, these preliminary operations are not possible. However, occasionally a flap is needed (Figs. 4 and 5). It should have a generous pedicle and must not be cut too thin. Small pedicled flaps form excellent covering for finger tips when a good deal of bone is exposed. They can be raised from the opposite side of the chest and the arm adequately immobilized in plaster so that after a few days it is not necessary to confine the patient to bed. In cases in which large flaps are needed, it is best to use pocket or double pedicled grafts to insure adequate blood supply.

It is my practice to allow the flap to remain attached to its pedicle for at least three weeks and then detach it all at once. If there has been a reaction or if there has been some circulatory disturbance in the flap, it may be wise to wait four weeks before detaching it. Detaching in stages in order to encourage the development of a good blood supply is seldom necessary and is somewhat hazardous in that a low grade infection may develop.

At times, a flap or other graft may be applied with safety several days after an injury. This should not be done as a routine procedure but should be reserved for those cases in which, for

Fig. 2. Crushing injury of hand with compound fracture of thumb and devitalization of skin over dorsal surface of distal and middle phalanges of index finger. Immediate cleansing of wound and primary closure by suture and, on the index finger, by skin graft. A, B, and C—wound at time of admission. D—at time of first dressing two weeks after primary care. E—three months after injury

some reason, primary grafting has not been feasible. As a rule, if the wound cannot be grafted at once, it is best to wait until a good clean granulating bed has developed.

Granulating Surfaces

BURNS are the most frequent source of granulating surfaces which require skin grafting. While it is obviously impossible to cover a burn

Fig. 3. Traumatic amputation of index, middle and ring fingers through the metacarpus and of little finger through base of middle phalanx. Wound cleansed and debrided and covered immediately with a split graft

with skin at once, the surgeon should make every effort to do so as soon as possible. The local treatment of burns should be so carried out that areas of skin which have been completely destroyed are grafted at the earliest possible moment. Careful cleansing of the burned area and removal of blebs and charred tissues followed by a sterile non-adherent and non-irritant pressure dressing (omitting tannic acid or other chemicals) will permit earlier skin grafting than any other method of burn therapy I have so far used. When the surgeon receives the burn in a late stage and there are grossly infected granulations, some time must be spent in local care to get the surface clean enough to allow skin grafting. The infected granulating surfaces usually respond quite rapidly to ordinary cleanly care and pressure dressings. It is my practice to dress the granulating surfaces once, or occasionally twice, daily; removing gently any necrotic bits of tissue; and cleansing the surrounding skin carefully with soap and water. The granulating area is then cleansed with boric acid or sterile salt solution and a single layer of fine meshed gauze is laid over it. The whole area is then covered with a voluminous pressure dressing made up of fluffed gauze and sea sponges wrapped on snuggly. Under this regime, granulating areas rapidly become red and healthy and as soon as they do so, they should be grafted.

Fig. 5. Traumatic amputation of radial half of distal phalanx of right index finger. Treated by immediate application of pedunculated flap from anterior chest wall on opposite side. A and B—immediately after injury. C and D—one month after injury

If the burn has been present for a long time and the patient is worn out and depleted by infection and fluid and protein loss, this aspect of the problem must also receive consideration. Liberal diet, high protein and vitamin intakes and transfusions are indicated.

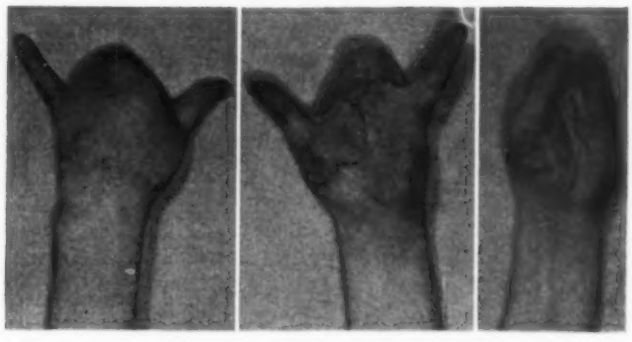

Fig. 4. Crushing wound of hand with loss of skin over entire dorsum and heads of second, third and fourth metacarpals. Treated by immediate application of pedunculated flap. Photograph of hand one and one-half years after injury

Fig. 6. Mangle burn of right hand. A—photograph of infected granulating wound at time of admission one month after injury; sloughing extensor tendon visible. B, C and D—wound after temporary closure with split grafts. E, F and G—the split graft has been excised and replaced with a free full thickness graft

The thick split grafts removed in large sheets from abdomen or thighs are used to cover the granulations. If the area is of long duration and the granulations quite heavy and underlaid by a thick scar bed, it is often well to shave them down with a razor or sharp knife before applying the graft. Usually, however, if there has not been too great delay between injury and skin grafting, the skin is applied directly to the granulations which have been kept flattened and healthy by the pressure dressings.

If the grafting can be done early, the initial thick split graft is all that is needed. If, however, the area is of weeks' or months' duration and a great deal of scar has formed, or if other plastic procedures such as nerve and tendon repair are required, the initial graft will have to be removed and replaced by some other more suitable one. However, the first indication is to obtain closure with skin. The free full thickness graft or pedunculated flap cannot be applied to granulating areas. However, as soon as these areas are well healed by thin grafts (Fig. 6), they can be excised and another more suitable graft applied in a sterile field.

It is desirable to keep a burned area splinted in a position of function during healing so as to minimize contractures which occur about joints and throughout the burned area. However, there is nothing to be gained by persisting in this splinting and by stretching granulation tissues for weeks or months hoping to prevent contracture while awaiting spontaneous epithelization. The longer the area is left open and the more the tissues are torn and fractured by stretching, the greater will be the scar; and when skin eventually grows over

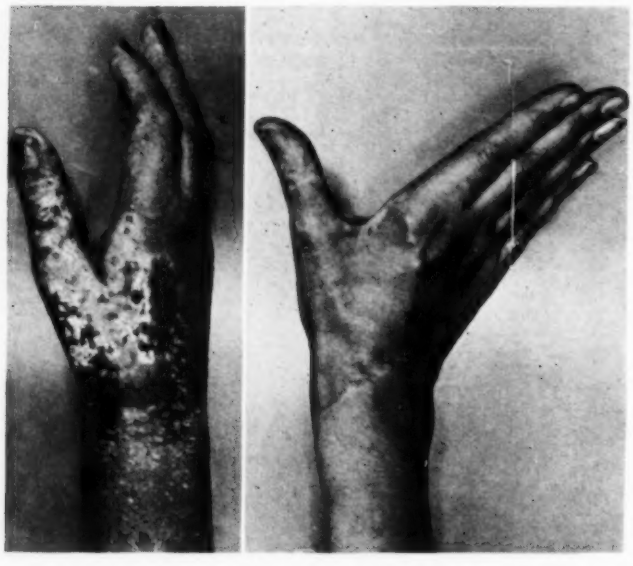

Fig. 7. Roentgen dermatitis of right hand treated by wide excision and the immediate application of a split skin graft

it, the contracture will still be present only much worse. If early skin grafting can not be done, much less scar and contracture result if healing is allowed to take place and the condition is corrected by skin grafts later.

Occasionally large granulating surfaces follow the sloughing of skin from over crushing wounds. As soon as these areas can be cleansed and clean healthy granulation obtained, they too should be covered with split grafts even if later pedicled flaps or full thickness grafts are needed.

Infectious processes such as, for example, carbuncles or microaerophilic streptococcal infection, or other types of infectious gangrene of the skin, may lead to loss of skin over smaller or larger areas. Such surfaces may be covered with split grafts and healing appreciably shortened. While most surfaces left by a carbuncle usually cover over rapidly as soon as the infection has been brought under control, some of them are very large, and the use of a graft is indicated. The raw surfaces left by infectious cutaneous gangrene are always susceptible to reinfection, are usually quite large, and grafting is imperative.

Fig. 8. Dupuytren's contracture. The palmar aponeurosis was completely excised. A small skin graft was necessary in order to obtain closure of the palm without tension

Freshly Dissected Surfaces

IN THE course of operations on the hand, the surgeon often is left with a clean or relatively clean freshly dissected surface which cannot be closed by suture. In such cases, he must have recourse to some type of skin graft. The type of graft used will depend upon a number of factors; such as, the possible degree of contamination present, the circulatory conditions of the bed, the structures exposed, the need for reparative procedures under the graft, and the use to which the grafted surface will be put.

The skin may be the site of an extensive *tumor* or other disease which must be excised. The removal of large angiomatous tumors or epitheliomas may leave defects in the skin which may be covered at once with split skin grafts. In the treatment of *irradiation dermatitis* (Fig. 7) and the carcinoma which is frequently associated with it, it is necessary to remove the whole of the involved skin back into good healthy areas.

In the case of carcinoma or irradiation dermatitis, the element of chronic infection must be taken into account. The infection lies quite deeply in the tissues and is probably partly accountable for the pain often characteristic of the lesions. Where large ulcerative areas are present, it is advisable to spend several days before operation in cleansing the hand and reducing the infection. The

hand may be placed upon a splint and dressed twice daily with moist dressings to promote drainage. If the infection is of any severity, warm moist packs may be of advantage. With the surface as clean as it can be made, a careful excision is performed, taking pains to prevent contamination of the surrounding skin with secretion from the surface of the ulcer. Split grafts serve the purpose very well and it is surprising how well the graft of intermediate thickness replaces excised palmar skin. If the element of infection is not great or is absent, one may use a free full thickness graft which produces a better surface and a more pleasing cosmetic appearance.

With irradiation injuries on the dorsum of the hand, particularly if the extensor tendons and bones and joints have been exposed, a flap is often necessary. A pocket flap serves the purpose very excellently and may be used to cover the dorsal surfaces of several fingers as well as the entire dorsum of the hand.

In the correction of *Dupuytren's contracture*, the surgeon will often find that the skin is so involved in the process that excision of larger or smaller areas is needed (Fig. 8). Defects of this type occur especially in the palm in the region of the distal palmar crease and on the volar surface of the fingers where the fascia is quite close to the skin and is attached to it by numerous vertical fibers. The vitality of the skin in such areas is seriously impaired, and when the underlying fascia is excised is likely to be entirely avascular. Such skin as well as that inseparably attached to the contracted finger must be removed, and the resultant defect covered with a graft. If careful removal of the palmar fascia is performed and care taken to leave subcutaneous fat and areolar tissue over exposed tendons, vessels and nerves, an immediate skin graft has excellent chances of surviving. My own choice is for a free full thickness graft which can be taken from the patient's forearm if the defect is not too large, otherwise from the inner surface of the thigh or lower abdomen.

Burn scars and the contractures associated with them form one of the most frequent indications for skin grafting in surgery of the hand. Some of the worst contractures which are seen in children follow burns of the hands which have been treated for long periods of time by persistent efforts at forced mechanical correction without any attempt at covering them with grafts. The scars may involve any area of the hand, but a great number of them affect the palm (Fig. 9) where they lead to flexion contractures of the fingers and thumb. The dissection of such contracted areas requires time and patience. Nerves and blood vessels should be identified and freed and pains taken to see that fat or fascia is available to draw over them before applying the graft. Dissection must be done in a bloodless field secured by means of a blood pressure cuff to facilitate identification of important structures.

The free full thickness graft, cut to exact size of the defect, is of the greatest value here. It should be sutured accurately in place after all bleeding has been controlled, and the large pressure dressing applied before the blood pressure constriction is released. The hand should be placed upon a splint with the fingers and thumb in the corrected position and the dressings left undisturbed for a period of nine or ten days before the first dressing is done. At the first dressing the grafted area is exposed, but the hand is not removed from the splint; a few of the sutures may be removed, and the pressure again applied. The remainder of the sutures may be taken out at the second or third dressing. The pressure is kept up for a minimum period of three weeks after operation. If there are areas of the graft which have not taken or where healing is slow, pressure is maintained until healing is complete.

Even in burn scars of many years' duration, correction is often possible despite the fact that fingers and thumb have been held in flexion. It may not be possible at operation to obtain complete correction of the contracture because of shortening which may have taken place in uninvolved structures. However, it has been our observation that this element of the contracture can be markedly improved if not entirely corrected by proper splinting later. The splint which was applied after operation may be fitted with straps so that the patient can remove it, and this can be worn for several weeks or longer after the hand has healed. At first the splint is worn continuously, being taken off once or twice daily when the hand is washed, soaked and massaged for 15 to 30 minutes in warm soapy water. Later, it is worn at night only far several weeks and finally when the maximum correction has been obtained, it is entirely discarded.

Fig. 9. Scar contracture of right and left palms in a boy eight years of age subsequent to steam pipe burn at the age of nine months. The right hand corrected first, and then later the left hand, by excision of scar and free full thickness skin graft. A—photograph of hands before operation. B—photograph of hands five months after operation upon right hand and two months after operation upon left hand

In case of burn scars in which tendons and bones are directly exposed by removal of the scar, it may be necessary to make use of pedunculated flaps. This is particularly true of burns on the dorsal surface where the tendons are almost always involved in the contraction.

Congenital deformities, particularly web fingers, require skin grafting for their correction. Despite the great number of ingenious procedures recommended for swinging flaps in the repair of

web fingers and the beautiful drawings which can be made of them, the attempt to separate such fingers without having recourse to skin grafts is almost invariably doomed to failure. The worst instances of this type with which we have been called upon to deal have been those in which a previous operation has been done and closure by suture attempted. Invariably, the web reforms, and the suture lines on the fingers are converted into contracted scars. In dissecting out such webs the surgeon should pay particular attention to nerves and blood vessels which also may be fused as well as the skin or bone. Because of this, it is also well in cases with multiple webbing not to separate all the fingers at once but to correct the condition in several stages so as not to endanger the circulation.

The free full thickness graft is indicated here. An exact pattern of the defect is cut somewhat in a butterfly shape and accurately sutured into place. A splint is needed here also, not only to keep the hand quiet but to keep the fingers widely separated until healing has taken place.

Fig. 10. Burn of wrist with destruction of median nerve and flexor tendons. Area first covered with split grafts, later replaced by pedunculated flap preliminary to nerve and tendon repair. A—after split graft. B—after application of pedunculated flap.

It not infrequently happens that the correction of a disability of the hand requires the *preliminary application* of a pedunculated flap before other repair can be undertaken (Fig. 10). This is particularly true in cases where a cutaneous contracture is associated with nerve and tendon injury, and a dense scar covered with thin skin lies over the divided structures. It would be impossible to repair the nerves and tendons without first replacing the scar with skin and subcutaneous fat. To raise a flap of poorly vascularized skin, attempt tendon and nerve repair beneath it, and suture the scar back over the operation site invites disaster. It is necessary in such cases first to replace the thin contracted skin with a pedunculated flap. After this flap is well healed, further plastic procedures may be accomplished beneath it.

I prefer to raise pedunculated flaps in stages previous to transferring so as to be insured of a good blood supply. The size and shape of the flap is determined, and the hand laid across the thigh or abdomen to determine a location where it will rest easily. This determines the site from which the flap may be raised. The previously determined pattern of the proposed graft is laid on this site, and the flap outlined, paying especial attention to the anatomic blood supply of the area. The flap is then partially raised by dividing it along one or two sides and separating it for one-third to one-half of its area from its bed. If the required graft is very large, one-third of it is raised at the first stage. After raising it is allowed to fall back on its bed and sutured. Ten days to two weeks later it is raised again; this time it may be entirely raised except for its pedicle and sutured back as before. If the flap is very large, it may be raised in three or four stages before the hand is placed under it.

After transference to the hand, the flap is left attached to the recipient site for a minimum period of three weeks. If there has been some disturbance, it may be wise to wait four weeks before dividing the pedicle. The raw surface left on the donor area following transference of the flap should be closed by split grafts.

Maxillo-Facial Injuries

—*Important Considerations*—

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THE high speed of present-day travel is responsible for the ever increasing number of severe crushing injuries of the face and jaws. The final results obtained in these cases is dependent upon early recognition and efficient treatment.

The importance of a thorough examination in all cases of traumatic injuries of the face cannot be over-emphasized. Frequently circumstance does not permit of a very thorough roentgenographic examination owing to the difficult position necessary to procure a good picture, therefore great caution should be exercised to prevent fractures from being overlooked. As these patients are usually first seen by the general surgeon this matter becomes his responsibility. Close collaboration with the oral surgeon in all of these cases is of the utmost importance, as he can usually detect fractures of the jaws and facial bones by

inspection and careful palpation. The presence of malocclusion, and inability to completely open or close the mouth, together with deformity and pain, are indicative of fracture.

If the physical examination reveals a fracture the radiographic confirmation may be delayed until further recovery has taken place. In the interim, reduction and fixation may be consummated. If the radiographic examination reveals no fracture, the exercised caution and treatment can in no way effect the patient adversely.

Many facial injuries are accompanied by severe shock and intra-cranial complications which demand immediate attention to save the patient's life. The control of hemorrhage, the establishment of an unobstructed air-way, and the relief of pain constitute the early routine.

In fracture wounds of the face it is not unusual to find foreign particles or spicules of teeth and bone. Surgical cleansing of the wound is the first step before immobilization of the fracture is attempted, as infection is the complication which stands out pre-eminently in these cases.

Temporary immobilization with the proper type of bandage aids in preventing further injury and adds to the patient's comfort. The four-tail and the Gibson bandage are the most satisfactory because they create upward traction under the mandible.

The four-tail bandage is as the name implies; the ends are split and tied on top of the head, causing traction under the chin. The Gibson bandage is a modification of the Barton in which the turns pass beneath the chin instead of in front, and are made secure by several alternating turns around the forehead.

If the patient is seen soon after the accident and is in good condition the fracture should immediately be reduced. However, it is often the safer policy to delay the approximation sometimes several days or until it is reasonably certain that the strenuousness of the operation will be well endured.

FROM the many methods and appliances used for the reduction of maxillary fractures it is evident that no one appliance is suitable or adaptable to all types of fractures encountered.

Each case presents different problems and the results obtained are in direct proportion to the skill of the operator. The treatment consists of correcting the facial deformity, re-establishing normal occlusion and maintaining the fragments in their proper apposition until union occurs. Usually perfect anatomical position means a perfect functional result.

In jaw fractures where there are a sufficient number of teeth present inter-maxillary wiring is the ideal method of fixation. It affords the opportunity of observing the occlusion during the entire process of healing, so that any accidental displacement which might occur can easily be noticed.

Inter-maxillary wiring is the fixation of the lower to the upper jaw by means of wires fastened directly to the necks of the teeth and twisted until the teeth are brought into occlusion. The ends of the wires are then cut off short and bent so as not to cut into the soft tissues.

Where bone fragments requiring reduction and fixation do not have teeth available for wiring, other methods have to be resorted to, such as circumferential wiring, direct fixation of the fragments with wire sutures, vulcanite or metal splints, and plaster or other head gear with elastic traction under mandible.

Circumferential wiring is a method used to immobilize fractures of the mandible for patients without natural teeth. Wires are passed around the body of the mandible and twisted over a splint placed on the dental ridge. If the patient is wearing a lower denture this may serve as a splint.

Wiring fractured ends of maxillary bones is occasionally necessary when approximation and immobility cannot otherwise be secured. Fortunately these cases are rare, and almost always a dental or interdental splint can be used to better advantage.

Another method once very popular but now seldom used in the treatment of fractured jaws is the interdental splint. Because of the possibility of error in restoring normal occlusion its use is generally limited to edentulous cases. Impressions of both dental arches are taken in plaster or compound and the model obtained is sawed through the line of fracture. The pieces are accurately fitted to simulate occlusion and the splint is made from this model. The material used in the construction of the interdental splint is either vulcanite or metal. When there are teeth present the splint is held in place in the mouth with cement. In edentulous mouths elastic traction under the mandible from a plaster head cap keeps the interdental splint in place.

The simplest method of making a plaster head cast is as follows: One end of a piece of stockinette is drawn over the head and brought below the occipital protuberance, just above the ears and on a level with the zygomatic arches, and about an inch above the eyebrows; the other end is tied on top and the excess cut off. Four strips of orthopedic felt six inches long and one inch wide are placed vertically on the stockinette, one in each quadrant, and held in place with adhesive. A three-inch plaster bandage soaked in lukewarm water is applied as a head bandage. The hooks are cut from ordinary wire coat hangers and are incorporated in the plaster, one in front of each ear. These are used as traction posts for a piece of five-inch rubber dam which goes under the chin, creating constant upward pressure.

A second plaster bandage is applied in the same manner and the whole thing finished off with a plaster wash. The end of the stockinette is slightly rolled while the plaster is still soft to insure a smooth edge all around.

Depressed malar fractures may cause permanent interference with mastication or produce visual and ocular disturbances if not properly re-

duced. Correction of this condition is best accomplished by elevating the fragments with a uterine tenaculum inserted through the soft tissues of the cheek. This method is simple, causes no disfigurement, and the deformity is not likely to recur unless the bones are badly shattered.

Infiltration anesthesia is usually sufficient to insure comfort in all of these procedures, however where there is marked deformity and muscular spasm to contend with, general anesthesia is indicated. The anesthetic of choice is one which produces relaxation with relative absence of nausea. Avertin comes closer to filling these requirements, its comparative safety and the method of administration make it ideal for operations about the face.

A suture through the tip of the tongue, long enough to draw it forward, improves the airway and should be a routine procedure.

Cleanliness of the mouth at all times is of the utmost importance, especially in compound fractures where the possibility of osteomyelitis is ever present.

It is not necessary to remove teeth to feed the patient whose jaws are wired together. There is sufficient space behind the last molars to permit liquids to be freely taken. A high caloric liquid diet should be prescribed and at least six to eight ounces taken every two hours.

IN conclusion it cannot be too strongly emphasized that:

1. Fractures of the face are not always accompanied by conspicuous deformity.
2. Malunion, non-union, ankylosis, loss of function, and many other serious complications are in many cases caused by faulty diagnosis and delay in treatment.
3. In the treatment of fractures of the jaws, bony union without disfigurement, good occlusion and normal function are the results desired.
4. Close cooperation between the oral and general surgeons in all injuries of the face and jaws is indispensable.

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ATTENTION is called to the announcement on page 10 in the front section regarding the "Institute of Industrial Medicine and Industrial Hygiene" comprised in the Annual Meetings of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS and the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION at Pittsburgh, May 5-9, 1941.

Physical Therapy

—Indications and Limitations in Railroad Surgery—

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MODERN transportation has increased enormously during the last 50 years. Our railroads have shared in this progress of transportation and the necessary increase in the enterprise, the speed and the number of employees have enhanced the exposure to injuries. It is a great responsibility that has been added to organized medicine, and it is our duty to use all our means for the benefit of the injured. Among our therapeutics physical therapy has long been used. The reports from the Etna Clinic in Syracuse have conclusively proved the shorter convalescence when such treatment is employed rationally. I agree with Dr. Mock who has said that 75% of all industrial cases need physical therapy. Fifty per cent of these can be treated with application of heat, massage and therapeutic exercises; the next 25% require some apparatus, such a diathermy, whirlpool, or ultra-violet radiation, which can all be done by the railroad surgeon. Only the last 25% require physical therapy methods that involve more experience and specialized knowledge or equipment, such as electrodiagnosis, hydrotherapy, etc.

It is my privilege to discuss the indications and limitations of physical therapy in railroad injuries. For this purpose I will try to analyze about 100 cases that have been referred to me from the New York Central. Most of these patients have sustained their injuries in the performance of railroad work in its various branches. Very few were passengers. As you all know the New York Central has an emergency hospital, which is in charge of very experienced traumatic surgeons. All my patients have been examined and diagnosed by one of these surgeons. The patients have been treated in the Department of Physical Therapy of the Hospital for Ruptured & Crippled under my supervision during the last two years. The total number of patients was 92.

Diagnosis	Number	Diagnosis	Number
Contusion	33	Dislocations	2
Low back	19	Tr. Arthritis	2
Fractures	16	Hand infection	1
Lacerations	5	Penetrating wound	1
Sprains	5	Nerve injury	1
Bursitis	3	Burn	1
Amputations	2	Tenosynovitis	1

During this time I only remember one definite neurosis. Her name was Sweet William, a disciple of Father Divine, and she was optimistic about everything except her shoulder. I think this speaks well for the efficiency of the staff of the emergency hospital.

Presented at the Seventeenth Annual Meeting of the ASSOCIATION OF SURGEONS OF THE NEW YORK CENTRAL SYSTEM, New York, September 25, 1940.

In looking over the diagnosis of these cases it was a surprise to find only one palmar infection of the hand. This is undoubtedly a tribute to early efficient treatment in the emergency hospital.

Most of the fractures were of the wrist and fingers. More than one-third of all cases were contusions and over one-half of these were contusions about the shoulder. In fact the upper extremities seem to suffer more from our modern transportation than the lower extremities. Forty-nine patients were treated for upper extremities, 13 for lower extremities and 20 for injuries to the trunk. The arms have to suffer for our facilitating the demand on the legs. The time interval between the accident and the beginning of treatment was as follows:

WEEK			MONTH						
1st	2nd	3rd	1st	2nd	3rd	4th	5th	6th	7th
7	17	9	19	16	6	1	2	3	12

It is evident that pathologies resulting from trauma require a certain period of rest before treatment. Fifty-two of our patients were referred within the first four weeks after the injury. However, I also find that 35 patients did not report for treatment until the first and second months after the accident. I may be wrong in my conclusion but I have an impression that these late patients were treated elsewhere or by themselves at home. This is borne out by the fact that the average number of treatments among patients referred one or two months after injury was 18, while 9.9 was the average number of treatments given patients referred within the first two weeks of the accident. You may draw the conclusion that if you wait four weeks or more before starting the treatment it will result in longer convalescence and more expense. Also of economic interest is the number of treatments given.

No. of Treatments:	3	6	9	12	15	20	25	30
Patients	12	25	11	15	11	7	4	7

This table shows that 63 patients received 12 treatments or less and the average was about six treatments. A few years ago I collected 100 consecutive traumatic cases in which the patient paid for his own treatments, and compared them with 100 consecutive compensation cases with similar diagnoses. I found that the compensation cases received 20% more treatment than the paying clinic patients. This was in the golden decade of 1920-1930. Large industrial clinics were organized for profit rather than cure, and I know of one such clinic where one technician treated an average of 60 patients a day.

It is gratifying to testify to the ethical attitude the New York Central always has maintained toward its employees and clearly evidenced by the foregoing statistics.

Some of you may be interested in what form of physical therapy has been most useful. To answer this I present the following table:

Heat	Massage	Diathermy	Galvanic-Faradic	Static	Hydro
71	74	58	14	6	6

Whirlpool	U. V.	Exercises
13	3	36

Heat, massage and exercises are the mainstay of treatment for railroad injuries. Diathermy is the most used electrical modality. This will answer the question that I meet with so often: "What kind of physical therapy should I buy for my office?" My answer has always been: "Put your money into the salary of a well-trained technician and not in apparatus."

Far be it from me to give the impression that all these 92 patients have been cured by physical therapy. I have not been able to follow up all of them. However, my charts show 37 with recovery perfectly satisfactory or markedly improved, 48 improved, and 11 not improved.

The limitations of physical therapy depend on the pathology present. Heat will aid circulation; massage will help nutrition tone and elimination; diathermy will relieve pain and promote absorption; and exercises will restore muscular power and joint action.

Conclusions

THE principal indications for physical therapy in railroad accidents are contusions, sprains, strains, and fractures.

2. Heat, massage, exercises and diathermy are the most important treatments for these patients. A properly trained technician is more important than expensive equipment.

3. When physical therapy is properly understood as to its limitations it is a most useful agent to return the injured to his occupation, and to restore his health.

Neurosurgical Lesions

—*The Diagnosis and Treatment of Those Producing Pain in the Back*—

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I WOULD like to talk to you for a few moments about conditions which produce symptoms which in the past have been occasionally given under the loose classification and label of sciatica. I do not wish to talk to you about the various lesions which produce pain in the back, such as the common sacro-iliac strain or arthritis of the lumbar or lower thoracic area, but what I do wish to emphasize and talk about are patients who have pains in the back or pains that radiate down into one or both lower extremities, otherwise those that have been grouped under the rather loose term of sciatica.

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There is no such thing as sciatica. There is such a thing as sciatic neuritis, irritating lesions of the sciatic nerve, but that is due to a very definite lesion and it does not originate in the sciatic nerve itself unless it be due to some toxic manifestations. Therefore, for the most part patients who have pain which radiates down the back of the leg are not the patients who have a lesion which is intrinsic within the sciatic nerve. The sciatic nerve is being irritated by a lesion elsewhere. Again, we do not believe there is such a clinical entity as sciatica and consequently we would not be among those who would inject the sciatic nerve with alcohol or salt solution without determining why the patient had pain down the sciatic nerve. Then we must find out why this patient has pain in the back which radiates down one or both lower extremities and down the posterior aspects of the extremities. What are the common causes of such a lesion? The most common are lesions of the cauda equina, the lower end of the spinal cord, that part of the spinal cord which contains the nerve roots which originate from the lumbar and sacral segments of the spinal cord, that part of the spinal nervous system which occupies the spinal canal, the top of the first lumbar vertebra. Indeed, the lower portion of the cord is surrounded by a large number of nerve roots, each of which exits through the intervertebral foramen.

What are the lesions of the cauda equina which are common? There are tumors of the cauda equina, tumors which originate from these nerve roots, always in our experience benign tumors; neurofibromas and tumors arising from the meninges surrounding the cauda equina, tumors which may be present for a long time because of the loose structure of the cauda equina and that do not produce a large increase in pressure in the canal, therefore the onset of symptoms may be slow and very insidious. In addition to tumors, there are inflammatory lesion of the nerve roots, particularly the membranes surrounding the nerve roots, so-called arachnoiditis. In these irritated nerve roots pain is produced which is exactly like that produced by tumor and other lesions which come under the same group. These are the most common. Very rarely a large vessel upon one of the roots will produce symptoms of caudal neuritis which are very difficult to distinguish from tumor or inflammatory lesions of the arachnoid membrane. That is very rare. For all practical purposes all you need to remember is that tumor of the nerve roots of the cauda equina and inflammatory lesions of the spider-like membrane which surrounds it are the two most common causes of pain in the back which radiates down the leg. There are some of you who are wondering why I did not mention protruding intervertebral disk. I will in a moment.

The most common causes of symptoms produced in the back by lesions of the cauda equina are tumors of the cauda equina and arachnoiditis. What are these symptoms? The patient begins to complain of pain in the back. The pain is increased on exertion, if he coughs, sneezes or does anything that in any way raises his intraspinal pressure. He has pain which radiates down the posterior aspect of one leg or both legs. The pain goes into the buttocks and down the thigh, and may involve the knee and the ankle. This pain is severe. It is increased by exertion and by anything which raises the intraspinal pressure. This pain is not relieved by rest in bed or extension on the legs. The pain is just as severe in bed as when the patient is up and about. If he coughs or sneezes while lying down he has pain just as severe. This pain is not relieved by placing extension on the patient's leg as is so often the pain of sacro-iliac strain.

In addition to these subjective symptoms these patients have definite organic findings, the most important of which is diminution of the knee jerks and ankle jerks or a complete disappearance of them on the side on which the patient has the pain. If the pain is bilateral and there is bilateral diminution of the knee and ankle jerks, that may be the only evidence of involvement of the root itself except the pain he has. If the tumor or lesion is a destructive one or produces a great deal of pain, then the individual has motor or sensory symptoms. He has an inability to move the muscles innervated by the sciatic nerve. He may have a complete foot drop, he may have inversion or eversion of the foot, depending upon how much the sciatic nerve is involved. His sensory loss depends upon the root involved, but particularly there is loss of sensation down the posterior aspect of the thigh and on the posterior aspect of the lower leg, corresponding to the lowermost segment of the fifth and sixth sensory nerves. If the patient has a rather large lesion in the cauda equina, he develops saddle anesthesia in which the lowermost sensory segments which innervate the buttocks are involved. As far as the sensory loss is concerned, saddle anesthesia is the most pathognomonic sign of a lesion of the cauda equina.

Those in brief are the symptoms, and if the lesion is large, if the tumor is large or the inflammatory lesion of the arachnoid membrane is great, the patient may develop bladder symptoms rather early. These are usually retention of urine, difficulty in starting the stream, or incontinence of urine. The rectal sphincter is usually involved as is the bladder sphincter.

Given such a patient who has pain in the back and down the back of his leg, with any or all of these symptoms present, I feel that even though none of these symptoms was present and knowing the patient has only pain in the back and down the leg, it is necessary for his physician to do a study upon the spinal fluid. Spinal puncture can be done at the usual level. If the tumor or lesion is above that point, he will find increase in the total protein in the fluid; he may find change in the color of the fluid—the fluid may be colorless, clear, or of a deep yellow color. He will find by pressing on the jugular vein and withdrawing the fluid a block in the arachnoid space. The difficulty of depending entirely upon the spinal fluid

examination is that sometimes the tumor is rather low in the spinal canal. The lesion may be below the point of the spinal puncture needle, in which case none of these findings may develop. Therefore, under these circumstances it is somewhat difficult to depend on spinal fluid examination and then one must depend on the clinical examination for the most part.

Now we have never felt that the indiscriminate use of other diagnostic methods, such as injection of lipiodol, was justified in a lesion of the cauda equina unless, as you will see later, exploratory operation has been decided upon before the lipiodol has been introduced, because it is irritating. It is difficult to get lipidol out of the spinal canal and there are cases on record in which lipiodol has been encysted in the arachnoid membrane and a lesion of the cauda equina has been produced by the encysted lipiodol. We feel that it is up to the physician to rule out, in a patient who has pain in the back down both legs, tumor of the spinal canal or tumor of the lower spinal cord or tumor of the cauda equina. To do that he must remember that lesions of the cauda equina produce no symptoms of the lower motor neuron, a flaccid paralysis of the muscles and loss of reflexes, in contradistinction to tumors higher up which produce spastic paralysis and no muscle atrophy.

In addition to these lesions which are definite and which have often been overlooked, there are those conditions which might better belong to bone and joint surgery. I am talking now about lesions of the intervertebral disk. To my belief these have been confused considerably by the large number of cases which have been reported in the literature with the symptoms produced by protrusion of the intervertebral disk. I think there are two clinical lesions, one is rupture of the nucleus pulposus of the intervertebral disk. Rupture of the nucleus pulposus produces eventually all the symptoms which I have just discussed as being due to tumor of the cauda equina, because rupture of the nucleus pulposus is a large mass which originates and which presses upon the spinal canal from the anterior aspect and can produce all the symptoms of compression that tumor of the cauda equina within the dura mater produces. There is no question about those cases. They have loss of reflexes, they have atrophy and they have pain. Unless one uses a diagnostic media, such as lipiodol or air in the spinal canal, it is impossible to diagnose them from intradural tumor of the spinal canal or cauda equina. They are very definite. They can be demonstrated pathologically because when one finally finds a tumor of the dura mater, there is a bulging mass of dura mater and when the dura mater is split the ruptured nucleus simply herniates. High up they come out like laminated tissue, like a little onion. There is such a thing as a ruptured nucleus pulposus of the intervertebral disk.

I am not so sure but we have become a little too enthusiastic about attributing every backache and every pain in the leg to a protrusion of the intervertebral disk. If you will look through the literature you will find in many thousands of autopsies protrusions of the intervertebral disk are not commonly found. I am talking not about protrusion of the nucleus pulposes but simply protrusions of the disk which give the symptoms I have just described. That they are present I am sure, but that they are present as frequently as we are led to believe I am not so sure. I think we should look at it with a great deal of clinical judgment before we decide that every patient who has pain has a protrusion of the intervertebral disk. We should look long before we inject lipiodol into that man's spinal canal unless we are sure we are going to take it out by operation.

IN a group of patients we have 90% or more with inflammatory lesions of the arachnoid membrane or tumor of the nerve roots of the cauda equina. Of the other patients we may have a ruptured nucleus pulposus, but we have a very small percentage that we have been able to verify by getting the mass out. Others we thought had a protruded disk had no result. The pain was relieved but it recurred. I think the larger the percentage of cases that are studied and the longer the period of time, the more apt you are to find that is true, that there is a protrusion of the intervertebral disk between the vertebrae, but they are pathologic. In all cases I am not quite sure. I think we should be very careful in our diagnosis. Given such a patient in whom we are trying to find out whether he has a lesion in the cauda equina, if we are unable to make that diagnosis definitely we should try to find out whether he had a lesion of the intervertebral disk. If necessary, and we are sure we are going to operate on that patient and explore the cauda equina, we would put in lipiodol which we would take out very carefully. We would take a patient who had pain in the back and see whether rest in bed with extension would relieve that pain if he had no radiation of pain down the leg. If he had radiation of pain down the leg but none of the organic signs, like loss of reflexes, loss of sensation or muscle atrophy, we would be very sure he did not have a lesion of the cauda equina or a protruded disk, but that he had a sacro-iliac strain or arthritis of the back either of which is usually relieved by rest and by extension.

Now these patients with ruptured nucleus pulposus may have a sudden onset following trauma, but the lesion may have existed many years before they begin to develop pain. When it is present, the symptoms are as definite as those of tumors of the cauda equina. Therefore, what I have attempted to say very briefly is simply to give you our opinion which is that it is the duty of the physician to determine the presence of an organic lesion within the spinal canal, particularly within the cauda equina, when the patient complains of pain in the back which radiates down one or both legs. If that patient has no signs of an organic lesion, such as loss of reflexes, loss of sensation or atrophy, it is the physician's duty to

watch that case because the patient should not be simply dismissed with the thought or diagnosis of sciatica, because in our judgment there is no such thing as a clinical entity known as sciatica. This pain is due to irritation of the sciatic nerve and that irritation is due to very definite pathology, either an inflammatory lesion or a cauda equina lesion.

Importance of a Medical Department

—in Industry—

W. M. JEFFERS,
President, Union Pacific Railroad

THE physical well being of industrial employees has a very practical as well as humane value. It is part of the social problem of the nation to which industry has been giving attention for many years.

Since my entire working life—now over a half century—has been with the Union Pacific Railroad, my contact with industrial medical service has necessarily been confined to that particular field. However, I am of the opinion that the fundamental benefits, as well as the basic considerations that underlie the whole program, are the same on the railroad as in any other industry.

In the inception, I believe industry became interested in medicine for an entirely selfish reason, namely, to protect the corporation in the payment of damages in the event of an employee being injured while on the job.

Later, there came the realization that industry received an additional benefit in the form of a growing mental contentment on the part of employees, and still later, as a result of this situation, the realization that humanization of employment has a very direct influence upon the success of a business venture.

The natural outgrowth of studies of the problem was to go to the prevention of accident instead of treatment of the patient after the accident occurred. Hence, came the growth of the safety movement in industry; and the safety movement brought into the picture the periodic examination of employees to ascertain their physical fitness before employment and to care for it after the employee got on the payroll.

In the railroad business, we have the additional safety factor of guarding the passenger whose purchase of a ticket imposes upon us his safe delivery at destination; and the very latest application of this latter principle is the addition of the nurse-stewardess to the train crew, a movement in which I am happy to say the Union Pacific Railroad has been the pioneer.

I hesitate to believe, however, that industry, in its first appraisement of the value of providing medical treatment of employees, projected the resulting benefits further than those immediately in sight. Those physicians and surgeons who became actively engaged in the work soon began to visualize other economic benefits. In this category of benefits, as the result of pre-employment examination and periodic examination after employment, can be cited a reduction in labor turnover, loss of time because of slowing up of production, accident prevention, and the general upbuilding of the morale and loyalty of employees and their response to management and discipline.

I am not familiar with the practice in other industries, but in the case of the Union Pacific Railroad, the employee makes a regular monthly contribution in the form of a payroll deduction to the hospital department. This is done not so much because of the aggregate sum involved, but because it brings home to the employee the necessity for the care of his health and also to place upon him some of the responsibility of taking proper care of himself for his personal benefit, for the benefit of his employer and for the benefit of those who may be dependent upon his earnings.

It is, of course, hardly necessary to state that the medical care and hospitalization made available for the employee through this method are far less expensive—by reason of the aggregate of his small monthly payroll deductions — than would be the cost of treatment for almost any serious illness or accident he might encounter during his working life.

Success of medicine in industry—and again I necessarily use my own company as the yardstick—depends very largely upon three principal factors:

First, the sympathetic support of the management.

Second, the wholehearted cooperation and loyalty of the employees, and

Third, a thoroughly competent medical staff in which both management and employees have complete confidence.

On the Union Pacific Railroad, I am happy to say, we have this trinity of conditions.

I am grateful of this opportunity to be before you and to pay tribute to the foresight and vision of E. H. Harriman, who laid the foundation of the humanizing policies under which this railroad operates, and to his son, W. A. Harriman, Chairman of our Board of Directors, whose deep interest in the employee has carried on the work established by his father. I am happy to have been enabled also to have a part in developing an esprit de corps on the Union Pacific which has given this railroad an employee relationship that has no superior in the railroad industry.

In the carrying out of these policies, a very large part has been played by you men of medicine and by the quiet and untiring efforts that you have contributed in making this success possible. These annual gatherings and the discussions that distinguish them have developed the remarkable progress that medicine can claim and have undoubtedly been the inspiration for the quiet and intensive — and oftimes unrecognized — research that has made medicine the noble profession it is.

Given at Banquet of the AMERICAN ASSOCIATION OF RAILWAY SURGEONS in the Grand Ballroom, Palmer House, Chicago, 7:00 P.M., September 17, 1940, Fifty-First Annual Meeting.

Tumors of the Head, Face and Neck

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IT MUST be obvious that this is a tremendous subject, so I shall confine my remarks to those conditions which have confronted us and with which we have had some experience.

We are all familiar with the very benign sebaceous cyst, yet in recent years we have found three such cases which had undergone malignant change and in which we had carcinoma on top of the sebaceous cyst. We believe that every sebaceous cyst when removed should be examined grossly at once and then on section to determine whether it is malignant or not. In such cases there are certain changes which take place that make one suspicious. The patient may have had a small tumor present for some time and suddenly this tumor may have taken on an alteration in type of growth. The tumor, from being smooth and doughy in consistency, becomes liquified and blue in color; there is blood-stained fluid contained within it, and the outer skin is thickened. Rapid growth in itself does not mean much. Those tumors that are pasty and liquified are suspicious. When you open them you will often find on some portion of the capsule of the tumor a peculiar little excrescence. In every case in which we have found this we found that the tumor had undergone malignant change. It is also interesting that the majority of these were squamous cell tumors that metastasize rapidly to the glands of the neck, and frequently the first finding is that of enlarged glands of the neck.

SO FAR as tumors of the face and scalp are concerned, we have two types, the basal cell and the squamous cell carcinoma.

The basal cell tumor is especially interesting because so often it follows mechanical injury, chronic irritations, application of irritants; it is a keratosis that looks not unlike the senile keratoses, and the largest percentage occur above the level drawn from each angle of the mouth. The ones above this are basal cell carcinoma. They start as keratotic areas; the crust is rubbed off and then it oozes, then bleeds, ulcerates, and then spreads. These almost never metastasize but by their erosion of tissue they may lose more tissue than in some other type. They may lose an ear or an eye or get through the ear into the bone. Those tumors occuring around the eye are very dangerous because the eyeball may be destroyed. It is very important that these be recognized early, as they are very malignant. They do not metastasize and can be cured and should be or they will destroy too much tissue. When the process about the ear or nose gets into the cartilage it is very difficult to cure it except by radical removal. If it has to be excised, it takes away part of the cartilage, and those areas do not respond to radiation as the tumor does elsewhere. You can treat almost any case of basal cell carcinoma of the face and get a good result, but when it involves the cartilage of the nose or ear, you may get a good result at first but a recurrence later on. Therefore, we are having more and more surgical excision. There is some question as to whether this type of carcinoma is radioresistant or not, but this really does not make any difference at all since the lesion is accessible and we know it can be cured readily without massive doses of radiation.

As to establishing a diagnosis in the clinic, we remove a small portion for microscopic examination. Occasionally we find a squamous cell tumor and, if so, it is treated with radiation. If these are excised, they are excised more widely than the basal cell lesions. The most common site is the lip. This tumor starts a little differently; it is not so characteristic early of a keratosis. It may be a papule. It may start in a fissure. It may start as an irritation, such as some men get by carrying things in the mouth. We have several instances in men who have smoked pipes; the tumor appeared where the pipe rode over the lip. This type of tumor grows more rapidly than the basal cell; the ulceration comes more rapidly; there is more infiltration, and it produces in some instances quite early metastases. It does metastasize and will kill the patient in the course of time if not taken care of.

It is important to know what type of tumor is present because it makes considerable difference in the treatment. As to treatment of the basal cell type, it can be treated with x-ray and radium and good results obtained. Because of its accessibility on the lip or face, you can use superficial or contact radiation or x-ray by screening off the rest of the body. It can be cured, and it can be cured by liberal excision to begin with.

We are beginning to feel that the tumor surgeon must be fundamentally grounded on plastic surgery. This applies to tumors of the face especially. It does no good to be conservative in the removal surgically of carcinoma, because, if you are, you think you have removed the tumor and you have not; you may get very good closure and then the tumor recurs. You must do a wide excision and often you have to remove so much tissue that you have to do something about the defect.

Recently a woman had a large basal cell carcinoma of the scalp one and a half inches in diameter that had not responded to radiation. I must warn against one thing and that is letting everyone treat such a tumor. We never treat a patient unless we have accurate knowledge of what the treatment was before we started treatment. If we know there has been radiation therapy and we cannot get information as to the type or amount of such treatment, we refuse any more radiation because we have seen disastrous results. We had one man we treated who went to another institution and they started in treating him without asking what had been done before. When we saw

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him next the whole side of the face had fallen away. Another man lost the whole lower lip because of injudicious use of radiation. Now coming back to the case of the defect in this woman, we did a wide excision of the ulcer and then applied at once a skin graft and put on sponge pressure and it was delightful to see that entire graft become adherent and close the defect. Within three weeks this woman could go around without a dressing and had a nice covering of skin.

I SHOULD like now to say a word relative to carcinoma of the lip. If carcinoma of the lip—and I speak of squamous cell carcinoma now—can be recognized before it is larger than 1 cm. in diameter, you can cure 90% of them. The only way we can offer our patients a high percentage of cure of carcinoma of the lip is by early recognition of the lesion, and if there is present any ulcerative lesion of the lip we should recognize it before it reaches the size of 1 cm. in diameter; then we should apply therapy and we can expect to offer a 90% cure. It is also interesting that if a patient is treated adequately before there are palpable glands, not over 20% of such cases will develop glands later. Therefore, we are laying down this postulate so far as carcinoma of the lip is concerned: If a diagnosis is made and the patient has early radiation therapy or surgical therapy and if he has no glands, nothing more is done at that time. If he returns with glands of the neck, then a dissection of the gland is done on the side in which the gland is present. Out of that remaining 20% who will develop enlarged glands you will get another 20% cure, so your percentage of cure in these cases should be high, if the condition is recognized early.

When a patient comes in with bilateral adenopathy and with a large carcinoma, you should not give up. You can treat these cases with radiation. You can destroy the local tumor without destruction of the lip. We feel that if there are bilateral glands of the neck, the chance of cure is remote, so we must direct our attention to adequate preliminary treatment before the glands appear.

AS TO salivary gland tumors, there are two types, the mixed and carcinoma. Carcinoma here is highly malignant. It metastasizes early, and in our experience is rather radio-sensitive. If you are going to remove such a tumor, it must be removed widely. On the other hand, they are accessible and subside very early with radiation therapy. Our experience has been that they all die of metastases. We had one patient who died of metastasis to the liver, in spite of the fact that he was adequately treated. I mention the mixed tumors merely to state that they grow slowly and are usually seen in the parotid gland. It is our impression that they are potentially malignant and, if they are removed, must be removed entirely and completely at the first time, and then you will cure the patient. If incompletely removed, they will return as a malignancy and then you are through. Some of these tumors are radiosensitive and some can be treated by radiation. We prefer to do an adequate and complete removal of the tumor.

This brings up the question, what about the facial nerves? Some men advocate that these should be sacrificed, and yet we hate to do this. It is a matter to decide whether the patient should live with a facial paralysis or die with a carcinoma.

IN tumors of the neck other lesions have to be differentiated, such as tuberculosis, leukemia, infections of the lymph nodes, Hodgkin's disease, carcinoma, etc. In dealing with tumors of the neck you must determine whether they are tumors and whether they are primary or secondary. It has been stated that the largest percentage of masses in the neck are not tumors but are Hodgkin's disease or secondary tumors from something found in the mouth and usually in the pharynx. We have repeatedly seen large masses of glands in the neck with primary lesion being carcinoma of the pharynx or tongue. The so-called lymphosarcoma is as a rule extremely radiosensitive, and all of these we treat with radiation. In Hodgkin's disease we begin with small doses in the hope of obtaining some remissions to last over a period of years. We have some patients who have lasted six years. If you get a long remission the first time, the final result is very much better.

The Management of Head Injuries

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I WISH to discuss the treatment of head injuries from the following standpoints: (1) Symptomatic, (2) Control of intracranial pressure, and (3) Treatment of complications, both surgical and non-surgical.

Symptomatic

FIRST and foremost is the treatment of the collapse (shock) which is so prominent in severely injured cases. These patients should have the head lowered, especially those who are stuporous or comatose and are vomiting or have considerable mucus in their upper respiratory passages. They should be on the side or face to prevent aspiration of mucus or vomitus into the lungs. After vomiting has ceased and the patient has regained consciousness or at least regained his pharyngeal and laryngeal reflexes, he may be left flat in bed. Most conscious patients (adults) seem to prefer being flat with perhaps one pillow, and we believe that the preference of the patient may well be followed in this respect.

External heat is of great value in the early care of these cases. It is applied on our service in the form of a large "heat cradle," the source of heat

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being lighted electric bulbs. In cases of severe collapse, the patient is immediately placed in one of these without any attempts to remove his street clothing or to give him a bath. This is important, as well-meaning nurses or attendants frequently add measurably to the patient's state of shock by unduly exposing him in their effort to remove his clothing, bathe him and otherwise "make him presentable." Obviously, if a patient is in shock the removal of his clothes and dirt, or even vermin, from his body should be postponed until his general condition has improved. One caution must be mentioned in connection with the use of external heat. Patients with brain injury, especially children, often have disturbance of their thermoregulatory mechanism. The rectal temperature should be taken hourly (every half-hour in children) and as soon as it is over 100° F. the application of external heat should be discontinued. Other forms of heat, such as electric pads, hot water bottles, etc., are equally efficacious. Some require greater caution to prevent burns of an unconscious patient.

Administration of fluid intravenously is often not only necessary but also life saving to these patients. Obviously, large quantities of isotonic fluids should not be given to patients who in many cases in a few hours will be liable to an increasing cerebral edema. Recent work (Coller and Maddock, and White, Sweet and Hurwitt) has shown the lack of necessity for administration of sodium chloride unless there is abnormal loss of it, which is rare in these cases. Excessive chloride probably will promote development of edema in injured tissue. For this reason we prefer to administer glucose dissolved in distilled water. A 10% solution is mildly hypertonic and will at once increase fluid volume and reduce tissue edema. In our experience, 1000 cc. is an ample amount to give in most cases.

Stimulants are of value to the patient in marked collapse. Caffeine, coramine, strychnin, or even powerful constrictors such as adrenalin or neosynephrine are used as indicated. Too rapid an elevation of blood pressure during the first few hours is to be guarded against, although doubtless its danger has been over-emphasized.

Next to the immediate treatment of the shock or collapse, quiet is of the greatest importance in the management of a case of head injury. Manipulation of the patient is restricted to the minimum required for necessary examination and essential nursing care. X-rays are to be postponed until the patient is both out of danger and is conscious and cooperative. Attempts to obtain x-rays earlier only endanger the life of the patient and usually end in failure because of lack of cooperation. The only exceptions to the rule are occasional special cases such as compound depressed fractures or suspect meningeal hemorrhage, and even here they are often better dispensed with. Until the patient has recovered from his initial collapse, surgical procedures including the suture of lacerations, reduction of other fractures, lumbar puncture, etc., must be postponed.

Sedatives are necessary in many cases and imperative in some. A wide choice is available. Morphine is always contra-indicated at least in the early stages. The author considers paraldehyde as the most valuable single sedative in the greatest majority of cases. There is a wide margin of safety in its use and it is rapidly excreted, so that it will not mask developing stupor or coma longer than a few hours. For the latter reason it has to be repeated every few hours if the restlessness or delirium persists. It may be given by mouth or rectum and repeated as necessary.

Mechanical restraints are necessary as a precaution in all cases not constantly attended or perfectly conscious, rational and cooperative. They are not to be considered as a substitute for sedation as the patient who is allowed to thresh restlessly in his restraints is harming himself by this activity as much as any other. In many cases they are a poor substitute for the constant presence of a nurse or attendant, and often they infuriate an otherwise tractable patient. They are a necessity where constant attendance is impossible for economic reasons, otherwise many embarrassing or serious accidents will occur.

The nursing care of patients with head injury, particularly those in coma, is of great importance. The care of the skin is as important here as in any other bed-ridden patient and may be made difficult by coma, incontinence and debility. The bladder and bowel also require special attention. The latter usually receives it because of the importance of catharsis or enemata in reduction of cerebral edema. The bladder may be neglected. Voris and Landes have shown by cystometric studies that most patients with acute brain injury have bladders which empty reflexly with 150 to 200 cc. of filling. However in contrast to this, others have an atonic bladder with no contractions with 500 to 600 cc. of filling. Dr. Jerry Kearns has pointed out that relatively slight obstruction of the urethra, such as mild prostatic hypertrophy or urethral stricture in the male or cystocele or rectocele in the female, may prevent reflex emptying of the bladder in comatose or stuporous patients. Palpation or percussion of the bladder alone is not sufficient to determine whether or not there is retention; the catheter must be used. Cystometry, if available, will give exact information on the neuromuscular status of the bladder. Constant drainage with an indwelling catheter, or the use of "tidal-drainage" (Munro) is necessary if there is any urinary retention—it is often advisable in cases of reflex emptying of the bladder to prevent the frequent soiling of the bed and consequent maceration of the skin.

Drainage of cerebrospinal fluid from the nose or ears is positive clinical proof of a basal skull fracture. Drainage of blood is suggestive, especially if from the ears. In the case of either, no effort should be made to obstruct it. The only exception to this is the occasional profuse nasal hemorrhage which may require a pack to control. This should not be left in longer than a few hours. Any irrigation or mechanical cleansing of the ear

or nose is to be avoided. In the case of drainage from the nose, the patient if conscious is to be cautioned against sneezing or blowing his nose A pad of cotton or gauze may be taped loosely against the ear or nose to collect draining fluid and removed as often as necessary. The patient should be kept flat until drainage stops.

Control of Intracranial Pressure

CEREBRAL injury is inevitably associated with at least local edema. It often is associated with marked increase in intracranial pressure. If edema or swelling of the brain is generalized, the cerebrospinal fluid is squeezed out of the subarachnoid spaces and ventricles and the brain presents the appearance of the so-called "dry brain" of the pathologist. Obviously, in these cases an accurate index of intracranial pressure is difficult to obtain by manometric measurement of ventricular or lumbar fluid pressure, especially the latter.

There are three methods available for the control of intracranial pressure following acute brain injury. The first of these is control of the fluid intake. The surgeon must order the amount and type of fluids that a patient is to receive, and the nurses and house staff must see that he does receive it. Obviously, it is necessary that nurses keep an accurate record of the patient's intake. A record of output is of great value, but often difficult to obtain accurately. We ordinarily limit fluid intake to 1200 to 1500 cc. in 24 hours. Conscious patients, of course take this by mouth. Unconscious patients or stuporous patients must receive fluids by other routes. The intravenous method is usually used. As previously stated, we do not give saline solution unless positively indicated, but prefer 5 or 10% glucose solution in distilled water. Patients who are comatose more than three days should have nasal feedings of a high caloric and high vitamin liquid diet. Nasal feedings also provide for administration of drugs, cathartics, etc.

Dehydration of a patient may be actively accomplished when indicated by saline cathartics, saline enemas, or the intravenous administration of hypertonic solutions. The first two are so well known as to hardly need comment, but it might be remarked that the rectal administration by the drip method of 200 to 400 cc. of a 50% solution of magnesium sulphate will often be as efficient in the reduction of increased intracranial pressure as the administration of 100 cc. of 50% sucrose intravenously, and will be a great deal less drastic from the standpoint of effect on the circulatory system.

The intravenous administration of hypertonic fluids is of great value in many cases of brain injury, and is very disappointing in others. Obviously this method requires an intact local circulation in order for it to work and of course the local circulation is more or less impaired at the site of cerebral contusion or laceration. Five hundred to 1000 cc. of 10% glucose, or 200 to 400 cc. of 25% sucrose, or 50 to 100 cc. of 50% sucrose are the concentrations and amounts most frequently used. Fifty per cent sucrose is very strongly hypertonic and is to be used with corresponding caution.

Drainage of cerebrospinal fluid by spinal or ventricular tap is a method of treatment concerning which there has been a great deal of dispute. Again it is a method of great value in certain cases, disappointing in others and at times positively dangerous. The danger would seem to be principally that of producing a herniation of the cerebellar tonsils into the foramen magnum or of the hippocampal gyrus into the incisura tentorii because of marked increase in intracranial pressure and relatively low cerebrospinal fluid volume. Ventricular drainage which is of such great value in certain cases of intracranial tumor has had little trial in cases of brain injury. It certainly deserves further trial. Cisternal puncture will always be contra-indicated where lumbar puncture is in cases of head injury. If there is danger of a herniation at the foramen magnum, cisternal puncture is dangerous if not impossible because of the obliteration of the posterior cistern by the prolapsed cerebellum.

Our attitude toward these methods can be best shown by the fact that out of 1394 cases treated on the neurosurgical service at the Cook County Hospital, only 231 were treated with intravenous administration of hypertonic solutions, with a mortality for the group of 37.2%. Forty-five were treated with lumbar drainages (receiving at least two) with a mortality of 17.8%. Another group of 102 patients received both forms of treatment with a mortality of 34.4% (Table 1). The mortality rate in these groups is not a fair criterion of the efficacy of the two methods for these were selected cases and spinal drainage was not used on many of the desperately injured patients who did receive intravenous hypertonic solutions.

TABLE 1.
RESULTS OF TREATMENT BY
C.S.F. Drainage and Hypertonic Fluids

Treatment	Living	Dead	Total	Mortality Rate
C.S.F. drainage alone....	37	8	45	17.8
Hypertonic fluids alone	145	86	231	37.2
C.S.F. drainage and hypertonic fluids	67	35	102	34.4

Treatment of Complications

THE treatment of complicated cases naturally resolves itself into the treatment of surgical and non-surgical complications. The indications for operative treatment may be briefly listed as (a) compound depressed skull fracture, (b) certain simple depressed fractures, and (c) extracerebral hematomas. Compound depressed skull fractures are to be operated on with debridement and primary suture within the first eight to 10 hours if the condition of the patient permits. Otherwise, the wounds are to be left open or loosely approximated, and allowed to heal by sec-

ondary intention. The fracture then may be elevated as an elective procedure if this is indicated. Unfortunately, if the wound becomes infected in the presence of comminuted fragments of bone, an osteomyelitis will usually result, and often meningitis or brain abscess.

The elevation of a simple depressed fracture is almost always an elective procedure and should be delayed until the patient is out of danger. Rarely it may produce local neurologic symptoms or more rarely increased intracranial pressure, and require early elevation. Many depressed fractures cause no symptoms and may be left alone. It is our practice to elevate those in the frontal region for cosmetic reasons and those near the motor area because of the frequency of post-traumatic epilepsy associated with depressed fracture.

Extra-cerebral hematoma, especially extra-dural, is of course an indication for operative interference. We have already called attention to the futility of operating on the acute subdural hematoma, although occasionally a case is benefited. It appears that subdural bleeding sufficient to produce a hematoma large enough to cause pressure symptoms is almost invariably associated with severe brain contusion or laceration. Chronic subdural hematoma develops slowly with a gradual onset of symptoms. Associated brain injury is usually slight and the patient has ample time to recover from it before evidence of his hematoma appears. The operative results are correspondingly good.

The diagnosis of an extra-dural hematoma in a typical (so-called) case should be easy. This is due to the fact that there is no severe associated brain injury and therefore the classic "lucid interval" is present. Then, too, there is an uncomplicated development of localizing signs. Unfortunately, the "typical" cases are in the minority as associated brain injury of considerable severity is often present. Thus patients are stuporous or comatose from the onset and localizing neurologic signs due to brain injury may be present from the onset. Then, too, the development of localizing signs may be masked in whole or part by pre-existing coma. Careful watch must be kept on all comatose or stuporous patients for the deepening of coma and the appearance of new localizing signs, or of signs of increasing intracranial pressure.

Since acute brain injury can and does often simulate the picture of a progressive lesion, an exploratory burr-hole under local anesthesia must often be resorted to.

I do not consider decompression to be of therapeutic value per se in cases of brain injury. First of all, no matter how skillfully performed it can only add to the trauma and edema already present. Secondly, it has been my observation in performing routine decompressions in cases of inoperable brain tumors that it requires several days to a week before adjustment of intracranial contents to the decompression takes place and signs of clinical relief as cessation of headache and vomiting and recession of papillo-edema appear. Obviously, a therapeutic procedure offering such tardy relief will be of little value in the treatment of acute brain injury.

The most important non-surgical complications that we have to deal with are meningitis, toxic psychosis, pneumonia and cardiovascular and renal disease. The new methods of chemotherapy have in our hands, as in others, greatly reduced both the incidence and mortality of intracranial infection. Toxic psychosis when associated with head injury is exacerbated by dehydration of the patient. It is essential to push fluids on these patients and to give ample sedation. At times some sedatives, especially the barbiturates, have a toxic effect and may add to the confusion and delirium. Where the vital centers (cardiovascular and respiratory) seem intact we may make an exception to our usual rule and use morphine as a sedative. It is also our impression that spinal drainages, especially where fluid intake is kept high, are of value in treating these cases. Needless to say, they are performed only with the patients under ample sedation.

During 1939 there were 1394 cases of head injury admitted to the neurosurgical service of the Cook County Hospital. Table 2 gives the results.

TABLE 2.
RESULTS IN 1394 CASES OF HEAD INJURY
Admitted to Cook County Hospital During 1939

Results	No. of Cases	Per Cent of Total
Recovered	1111	79.7
Disabled	91	6.5
Dead	192	13.8
Within 6 hours after admission	45	3.3
Over 6 hours after admission	147	10.5

The disabled group includes only those patients who left the hospital with a neurologic defect that was expected to be permanent. Table 3 shows the distribution of cases by decades with mortality rates. This table shows strikingly the importance of the age of the patient in determining his chances for recovery. Many other authors have commented on this.

TABLE 3.
DISTRIBUTION OF CASES BY AGE

Ages	Total Cases	Recovered	Dead	Mortality Rate Per Cent
10-19	53	51	2	3.8
20-29	178	165	13	7.3
30-39	279	257	22	7.9
40-49	282	254	28	9.9
50-59	266	231	35	13.2
60-69	153	127	26	17.0
70-79	79	36	10	21.7
80-89	14	10	4	28.6
Unknown	123	71	52	42.3
Total	1394	1202	192	13.8

Necropsies were performed by Dr. J. J. Kearns, the coroner's physician, in 74 cases, or 38.5% of

the deaths. Table 4 gives what was considered to be the principal cause of death in these cases. It has already been noted that in 21 cases (28.4%) of the necropsies, the principal cause of death was due to miscellaneous associated injury or disease. A large group of cases (25.7%) had subdural hematomas. These were practically all of the so-called acute type. In another paper I have called attention to the high operative mortality in acute subdural hematomas, and to my belief that only the occasional case of this group should be treated surgically.

TABLE 4.
NECROPSIES PERFORMED IN 74 CASES
(38.5% of Total Deaths)

Necropsy Findings	Number	Per Cent
Extradural hematoma	8	10.8
Subdural hematoma	19	25.7
Cerebral laceration	26	35.1
Miscellaneous associated injuries or diseases	21	28.4
Without Skull Fracture	29	39.2
With Skull Fracture	45	60.8

The mode of injury is of considerable interest in dealing with cases of head injury. Table 5 shows that the cases can be divided into four almost equal groups, one injured by automobile accidents, another by some form of assault, another by falls, and a fourth by miscellaneous or unknown causes. The high percentage injured by falls speaks for a high percentage of alcoholism

TABLE 5.
MODE OF INJURY

	No.	Per Cent
Automobile	346	24.8
Assault	346	24.8
Fall	347	24.9
Miscellaneous	56	4.0
Unknown	299	21.5
Total	1394	100.0

and syncopal attacks; the high percentage injured by unknown causes includes a large group of critically injured cases who were picked up by the police and brought in without any history.

Seven hundred and ninety patients suffered associated injuries to other parts of the body, often multiple and most frequently the face, extremities and chest. Table 6 gives the detailed figures for the location of these injuries.

Summary

AGE seems a very important factor in determining survival.

2. Associated injury and disease are also important factors in determining survival. This is especially true in the older age groups.

3. Surgery should be performed in a comparatively low percentage of cases of head injury. Acute subdural hematoma has a high surgical mortality, and only the rare case of this group should be operated on. Chronic subdural hematoma is a much more favorable lesion from the surgical standpoint and operation is always indicated in these cases.

4. Watchful conservatism gives the best results in the management of head injuries. Supportive treatment, enforcement of rest, and careful nursing care and observation pay high dividends.

TABLE 6.
790 PATIENTS WITH ASSOCIATED INJURIES

Face	528
Extremities	321
Chest	132
Neck	33
Abdomen and Pelvis	26
Spine	19
Spinal Cord	3
Peripheral Nerves	1

5. Special methods of reduction of intracranial pressure are of value in selected cases. Their routine use is to be condemned.

6. Approximately 40% of cases dying of head injury have no demonstrable skull fracture at necropsy. This shows the absurdity of relying on the presence or absence of fracture of the skull in determining prognosis or treatment.

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Central States Society

—Proceedings of the Annual Winter Clinical Session of the Central States Society of Industrial Medicine and Surgery, St. Luke's Hospital, Chicago, December 6, 1940—

THE Annual Winter Clinical Session of the CENTRAL STATES SOCIETY OF INDUSTRIAL MEDICINE AND SURGERY was held on Friday, December 6, 1940, at St. Luke's Hospital, morning and afternoon sessions, and an evening session at the Palmer House, with a dinner in honor of the guest speaker, DR. CLAY RAY MURRAY, who spoke on "Correlation between Fracture Treatment and Fracture Pathology." The program follows:

PRESIDENT JAMES A. VALENTINE, M.D., presided at the sessions, and DR. ROLAND A. JACOBSON was the Program Chairman.

"Pathological Conference"—EDWIN HIRSCH and the Hospital Staff.

"Spondylolisthesis"—FREMONT CHANDLER, Asst. Prof. Orthopedic Surgery, Northwestern University.

"Mental Conditions Associated with Trauma"—ROLAND P. MACKAY, Assoc. Prof. Neurology, University of Illinois.

"Spinal Cord Injuries"—WESLEY A. GUSTAFSON, Neurosurgical Dept., University of Illinois.

"Hernia in Industry"—WILL F. LYON, Asst. Prof. Surgery, University of Illinois; Chief Surgeon International Harvester Co.

"Causes of Impaired Union in Fractured Hips"—GEORGE L. APFELBACH, Clinical Prof. Surgery, Loyola University.

"Traumatic Lesions of the Genito-urinary Tract"—HARRY CULVER, Assoc. Prof. Urology, Northwestern University.

"Industrial Dermatitis, Diagnosis, Scope and Prevention"—CLEVELAND J. WHITE, Asst. Prof. Dermatology, Northwestern University.

"The Silicosis Problem after Eight Years of Medical and Engineering Control"—A. O. SANDER, Milwaukee, and H. E. DAVIS, Northwestern University.

"Open Reduction Treatment of Fractures"—JAMES A. JACKSON, Jackson Clinic, Madison, Wisconsin.

Morning Session

THE first number on the morning session was a demonstration of cases in a pathological conference given by DR. EDWIN HIRSCH and the Hospital Staff.

Among these was one of carcinoma of the large bowel with metastates, and also a case of gall-bladder stones followed by abscesses and infection after draining.

The postmortem record of the hospital for November showed 25 deaths and 16 postmortems, or 64% postmortems done; up to the time of the meeting, the records showed eight deaths with a postmortem record of seven, or 90% postmortems.

DR. FREMONT CHANDLER, in speaking on the subject "Spondylolisthesis," said that this disease was an old entity, first being known in the late 18th century. The original etiology was attributable to injury. In connection with the presentation, the anatomy of the vertebral column was reviewed by lantern slides and also by various diagrams, particularly with reference to the relation of the pedicle to the processes.

The mechanism of the production of this condition tends to slip the last lumbar vertebra forward and downward, according to the degree of angulation. A very fine demonstration was given of a model showing the point of separation. Various theories were also illustrated.

With respect to x-ray evidence, the lateral view is most significant to show the type and amount of separation. Occurrence is mostly at the level of the fifth vertebra, although sometimes above. This is accompanied by a prominent bulging at the end of the spinal crease.

In attempts at remedying the defect, the first fusion operation was done in 1914 by Ryerson. At first in the study of this condition it was thought that it occurred only in females, but now it occurs in greater numbers in males and is known to have occurred in children.

The incidence is approximately 3.5 to 4%; Willis has, in fact, shown that there is an incidence of 3.8% in the number of skeletons which he has examined.

An examination of 150 infants has failed to reveal the occurrence of the fracture.

In treatment, one should build up the strength of the area. In the use of operative measures, fusion gives symptomatic relief and immobility.

In the discussion, it was stated that only one segment should be included in the graft. Slipping process is so slow that no neurological symptoms occur. Most cases occur early in life. There is always a question of whether there is a fracture or separation. Probably early changes weaken the structure so that it easily fractures or separates at a later period. Statistically, probably 80% preexist and 20% occur as traumatic cases in adult life.

DR. ROLAND P. MACKAY, in discussing "Mental Conditions Associated with Trauma," stated that his discussion would be limited to the psychotic states and to those which follow head injuries. There are what are known as primary conditions which are directly due to brain injury and secondary conditions in which paresis or alcoholic delirium are precipitated by head injuries. The incidence is higher in males, and more severe in those of advanced age, probably because of the factors of arteriosclerosis and instability.

The mildest types are the so-called ordinary concussions, in which there is a recovery after unconsciousness without permanent effects.

An example of the story of Gene Tunney was cited in which there was an amnesial period following the severe bumping of heads in a boxing bout.

In the severe states, the depth of unconsciousness is the criterion for prognosis — meaning the depth and duration of coma. Such persons may go through a so-called "occupational" delirium, repeating occurrences to which they are accustomed in their various jobs. Some have no memory of what has transpired, although they may act naturally. There may be some disorientation and in such instances the imagination fills in the spaces with weird stories accompanied by mood changes.

The prognosis varies greatly—it is better in children and young adults, and worse in alcoholics. There are great differences in mental compensation.

Regarding treatment, the less one does in acute cases, the better. Sedatives should be avoided in psychotic conditions. Separate rooms are advisable, if possible; no restraint should be used. It is much better to make use of hydrotherapy, such as the continuous hot bath or cold packs. If drugs must be used, paraldehyde by mouth is preferable. Ample fluids should be used, after the danger of cerebral edema is past—in this respect, orange juice is desirable.

Most persons have postural headaches and postural vertigo. There is poor concentration of the mind. The scalp shows variable paraesthesias. The pressure seems to be in the back portion of the head. Individuals are irritable and impulsive. It is fairly easy to label the malingerers.

But there is a typical story and the subjective experience is quite important. There are compulsive ideas.

In the post-traumatic headache, one can use phenobarbital in small doses.

Sometimes an encephalogram causes a remission of symptoms.

Trauma may precipitate paresis and thus a painstaking examination must be done. Alcoholism may cause hallucinosis, although the subject may have been normal before the injury.

Injury may also precipitate schizophrenia or manic depressive psychosis. Such cases are difficult to evaluate.

In the discussion with reference to football injuries, it was pointed out that if temperature and orientation are what they should be, the man may play again; but if he is a repeater and has peculiar personality, it is doubtful whether he should go back into the game. The discussion also included points regarding differentiation between malingering and real cases in accidents. It was especially emphasized that if complications are really going to occur, the psychotic symptoms follow fairly immediately.

DR. WESLEY A. GUSTAFSON presented a paper on "Spinal Cord Injuries." The most mobile parts of the spine are the cervical region, the 11th and 12th dorsal and the 1st and 2nd lumbar, the degree of mobility being in the order listed. In a series of 400 cases, 70% of the fractures were in the cervical region and 10% in the thoracic and lumbar regions.

Injuries may be of several types: (1) the disc may be moved forward and this may occur unilaterally or bilaterally—the cord damage is variable; (2) there may be crushing fracture of the bodies of the vertebrae; and (3) there may be a combination of fracture and dislocation.

In concussions and contusions, there may be residual neurological findings; there may be bleeding around the cord; there may be hemorrhage into the cord; or there may be herniation.

In consideration of cord injuries resulting from fractures or dislocations, a diagram was used to indicate the nerve supply and the various lesions.

In primary treatment, attention should obviously be given to shock. In the primary examination, the important thing is the sensory examination. If sensory reaction remains intact, with respect to 3rd, 4th and 5th sacral, there is no transverse lesion. When acute flexion of the great toe on the sole is complete, there is not a complete lesion.

Later, complete examination may be made after transport which must be careful, as 70% of the fractures are in the cervical region. The head should be supported by the use of long boards which act as a splint for the entire body. X-rays should be taken without moving or manipulating the head. Probably it is best to transport the injured person while lying on the abdomen and chest.

When in the hospital, further care of shock should be given and the spinal fluid should be examined.

A lantern slide was shown depicting the recent apparatus devised for the purpose of exerting traction on the head while patient is in bed. This is probably best supplied for the first 24 to 48 hours. If then there is still evidence of spinal block, the spine should be fixed and decision made on further treatment.

Another method used for traction is the use of a halter and cast, on which is exerted pressure up to five pounds.

In the dorsal region the fractures are usually compression fractures in type and may occur with cord damage. In the lumbar region, because of the anatomical differences, evidence of a compression fracture indicates a laminectomy.

The complications are usually severe and among them occur bedsores and bladder paralysis.

With reference to bedsores, an air or water mattress should be used if there is anesthesia.

In bladder paralysis, the Monroe apparatus was demonstrated on a patient. Using this apparatus, a cystometric reading of the bladder is first done and the apparatus is then set to keep volume at about 300 to 400 cc. (at about a rate of 30 drops per minute). This continuous drip consists of a 1 to 20,000 permanganate solution, which builds up the pressure and can be read on a manometer. Automatic emptying occurs at the proper time in a syphon bottle. The bladder tone is thus preserved.

In closing, it has been found that occupational therapy is very valuable for these patients.

DR. WILL F. LYON spoke on "Hernia in Industry." The prevailing tendency in medicolegal cases is not to compensate for hernia as frequently as formerly. The Ontario Commission has studied the problem seriously and has deleted hernia from the list as an accident. Ohio has been turning down about 75% of the claims. Probably Illinois and Wisconsin are as lenient as any state.

There is no doubt that indirect hernias represent a persistence of the peritoneum.

In an experience of 20 years, comparing large rings with small rings, the incidence of hernia was identical. It is to be borne in mind that palpation only gives the condition of the external rings and by the time the bulge reaches that structure, there has long since been a hernia.

The essayist does not agree with those who believe that applicants with large rings should be turned down. The trouble comes not from accepting those with hernia, but accepting those who do not have hernia. The speaker has not seen a strangulation as an accident, when a hernia was demonstrated at the time of employment.

Big hernias have been observed in heavy laborers without the use of a truss, but big hernias do not really make trouble.

A hernia is a benign condition and does not necessitate an operation unless it troubles the man. When operation is considered, one must fulfill the requirements of a low mortality in previous operative experience, and chance of good repair.

The experience does show that multiple recurrent sacs of the cord occur.

A summary of the repair in five different classes of hernia was given: (1) in the simple indirect and incomplete hernia one should do high ligation and secure a snug ring; (2) in a complete hernia, one should change the hernia to a simple indirect one and do a hydrocele operation; (3) in the direct inguinal hernia, one must do a repair of the defect and ordinarily it is not necessary to open the peritoneum; (4) in the femoral hernia, the inguinal ligament should be cut to reduce the hernia and afterward should be sutured; and (5) in the so-called "sliding" hernia, one should open the sac where the bowel is not adjacent and be very careful of freeing the bowel,—if there is difficulty or bleeding, the first third should be turned down and the pursestring put in and the second third treated accordingly, etc.,—this is a safe way to dispose of any hernial sac.

With reference to other points, DR. LYON believed that it was best to do a herniotomy under local anesthesia because there are fewer recurrences and the mortality is lowest; repair is made with silk or some nonabsorbable suture; it pays to scarify the inguinal ligament by gauze before suturing.

Only a few hernias are well held by trusses in active workmen—usually the truss is more detriment than help. It can, however, be a help if it is properly fitted and kept in place.

The essayist did not do the injection type of hernia, because he felt that he could not appraise conditions which can only be found by operative technique.

Afternoon Session

DR. HARRY CULVER discussed "Traumatic Lesions of the Genito-urinary Tract." Space will only permit of consideration of two types of traumatic lesions of the urethra; (1) the so-called straddle injury and (2) injuries associated with fractures of the bony pelvis.

The male urethra is divided into the anterior and posterior urethra by the urogenital diaphragm or triangular ligament; this likewise separates the site of trauma in the two above mentioned types of lesions, the anterior urethra being involved in straddle injury and posterior urethra in injuries associated with a fractured pelvis.

The straddle injury of the male urethra is produced by direct sudden force applied against the perineum usually caused by the patient falling astride some fixed object resulting in various degrees of injury. If urination is not interfered with and the bleeding is not severe, no intra-urethral manipulation is indicated but morphine to control the pain, ice packs over the perineum to control hemorrhage, are all that is necessary. Eventually incision and evacuation of perineal clots may be necessary. If bleeding is profuse and a catheter can be passed it should be left indwelling as a means of controlling hemorrhage. Obviously if there is a retention of urine and no catheter can be passed, or if bleeding is too profuse to be controlled by catheter or external pressure, surgical intervention is indicated and should always be done by perineal incision. By evacuating clots, removing fragments of devitalized tissue, ligating bleeding points, attempts should be made to find the deep end of the traumatized urethra. If this cannot be readily done it is much better to do a cystotomy and retrograde catheterization than to unnecessarily prolong a futile search in the perineum. In either event the bladder is drained through a perineal catheter and perhaps a second catheter is placed from the meatus, pulled through into the bladder and the perineal would is closed loosely.

With the interference in urination following trauma resulting in fracture of the bony pelvis similar degrees of trauma are encountered as in the first class; i.e., there may be slight injury but no interference with urination nor any important bleeding. This naturally calls for no local treatment at this time. However, the trauma may

be very slight but urinary retention shortly supervenes. The passage of a soft rubber catheter is then attempted and if it stops in the region of the urogenital diaphragm no further attempt should be made (stiff catheters and metal catheters are to be condemned). Inability to go beyond the urogenital diaphragm makes for the necessity of a surgical procedure and in this instance should always be started suprepubically. The bladder should be opened and the traumatized urethra brought in line by means of two sounds, one passed from the meatus and one retrograde from the bladder; the one from the outside is gradually worked into the bladder and used as a guide for an indwelling catheter which is brought out with it. This catheter acts as a splint for regeneration of the traumatized urethra as well as a fixing structure to hold the two layers of the triangular ligament in proper alignment. The bladder is closed with drainage and perivesical drainage as well. The inlying urethral catheter is the last thing to be withdrawn and that never before 12 to 14 days.

It should not be necessary to mention that any traumatized urethra should have the benefit of intermittent soundings over many months and sometimes years to prevent the formation of traumatic stricture which invariably follows. Too frequently is the site of the traumatic lesion neglected and the only surgical treatment at first is suprapubic drainage. This makes for profuse scarring at the site of the lesion with permanent dysfunction of some of these structures. Repair of the urethra should not be neglected longer than a two week period.

DR. CLEVELAND J. WHITE presented the subject "Industrial Dermatitis, Diagnosis, Scope and Prevention." One has to decide whether the lesions presented for examination are industrial, whether there is a tumor present, or whether there are acniform lesions.

A number of very fine lantern slides, some in color, were used to demonstrate the different types of lesions, among which were a fungus infestation on the dorsum of the hand, allergy due to dust and feathers, arsenical keratoses, milia albicans, lichen planus, psoriasis, oil dermatitis, nickel dermatitis, erythematous lesions on the feet (from chemicals), herpes, sporotrichosis, and recurrent lues of the face.

It should not be forgotten that active ringworm sensitizes the skin to chemical exposures. In this respect, patch tests are only confirmatory and are not entirely diagnostic. Fungi have been found in the inguinal nodes in certain cases.

Lesions of the nails occur from mechanical trauma and have also been found with respect to trichlornaphthalene exposure; but it should be remembered that psoriasis and ringworm also affect the nails. Ringworm of the nails has also been blamed on different types of nail polish.

In summing up, one has to take a very careful history and know the details of the industrial exposure, as well as differentiate lesions which occur because of nonoccupational sources.

DR. O. A. SANDER and Dr. H. E. Davis presented the subject "The Silicosis Problem after Eight Years of Medical and Engineering Control." Dr. Sander presented first an extensive series of serial x-ray films of the same persons, taken over a period of seven years.

As important as the diagnosis is, the prognosis is more important; what everyone wants to know is what the silicotic or the person with silico-tuberculosis will do in the next five to 10 years.

This was demonstrated by a group of cases on which serial x-rays had been taken of persons who had developed silicosis. In most instances, these persons showed no progression of the disease in a period of seven years, after they had been removed from the original hazard and had been kept on periodic observation.

The procedure used with respect to the diagnosis of the development of infection is briefly this—if the sedimentation rate suddenly rises, the patient is put through a series of stomach washings for three days on a fasting diet, and the washings examined for tubercle bacilli. This procedure has been found to be very reliable.

In the discussion, Dr. H. E. Davis noted that silicotics are usually those who have something wrong with the lungs at the time silicosis develops. He believes that this is so after examining a large number of films.

Dr. Hollis Potter in discussing the subject stated that an acute exacerbation can occur in anyone who has tracheobronchial caseation; it is apparent that the State of Wisconsin has a better system of handling these cases than some of the other states. It should not be forgotten that tuberculosis often heals in the presence of silicosis —this is not realized by a great many men.

DR. JAMES A. JACKSON presented the final number of the afternoon program "Open Reduction Treatment of Fractures."

If we have proper teamwork and the necesary armamentarium, we will get brilliant results.

Lane's technique was the first development, but later there was a reaction on account of bad results; now the pendulum is swinging the other way. Probably the method of electrolysis has been overstated.

Motion pictures were shown depicting the use of the Jackson bone clamp and the special depth gauge for the length of screws. Demonstration was also made in the pictures of the so-called Parham bands. Lantern slides were shown depicting comminute fractures of the clavicle; fractures of the head of the humerus; oblique fractures of the humerus; multiple fractures of the lower end of the humerus; supracondylar fractures of the elbow; fractures of the olecranon; fractures of both bones of the forearm; and a large number of different types of fractures of the femur.

The Industrial Nurse

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SINCE the nurse in industry is now expected to be not only a graduate registered nurse, but increasingly also one with public health preparation, it is necessary to consider the question of supply and demand for industrial nursing somewhat in terms of whether or not there are enough nurses for other fields.

The Nursing Council on National Defense has stated its belief that until the demand for additional nurses in military and allied services was made the supply and demand were fairly well balanced. Four thousand nurses will be selected for the Army by July 1 and an additional number will be needed in allied fields in the near future.

To meet this increase, it is thought that at least 4,000 additional students should be admitted to schools of nursing this year and that the facilities of good schools can be extended to accommodate them. In general it may be said that increasing demands for nursing services are to be expected which will require for the next few years a continued increase in the number of students to be educated.

Number of Nurses

THE last count made by the U. S. Public Health Service in 1940 shows a total of 23,705 public health nurses in the United States and 3,271 of

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Abstarct of a paper read at the Third Annual Congress on Industrial Health, Chicago, January 13, 1941.

these were listed as industrial nurses. This is an increase in public health nurses other than nurses in industry of 27.5% (per cent), in the last decade. The number of industrial nurses counted in 1940 was practically the same as in the 1930 census.

It is rather generally conceded that still more public health nurses are needed. The most common number recommended is 60,000 to 70,000 in all or about three times the present figure. Moreover, due to defense activities, the need for public health nurses is expected to become increasingly evident now. If a sudden demand were to occur, it would be difficult to find qualified nurses to meet it, since even now, there is a shortage of well prepared public health nurses.

The field of industry is incompletely covered by nursing service. According to estimates made in a "preliminary survey of Industrial Hygiene Problems in the United States," reported upon in 1940 by the U. S. Public Health Service, only about one-third of the industrial employees in this country now have either full-time or part-time industrial nursing service.

If it could be assumed that this percentage of workers in the United States receive adequate nursing service and that the needs of the other two-thirds are similar, it could be said that 6,000 additional nurses are needed in industry. Since neither of these assumptions would be entirely correct, the number of nurses needed cannot be so definitely stated. It seems probable that in industry, as in other fields, counted as public health nursing, two or three times as many nurses as are now available could be used to advantage, either on a full-time or part-time basis.

That the gaps in nursing as in other health and safety services for industry are chiefly in the smaller plants, is also shown in the U. S. Public Health Service Report already mentioned. The report states that in plants employing more than 100 workers, 45.7% have full-time plant nurses while 1.9% have part-time nurses, but in plants employing less than 100 workers, only 1.1% have either full-time or part-time nursing service.

The minimum number of employees which justify the employment of a full-time industrial nurse depends on such factors as the hazards of the particular industry and the other health resources available in the community where it is located. In a southern mill town for example, where there is no other nurse in the area, it would probably be good business to employ one industrial nurse for no more than 100 or 200 employees and their families.

However, it may be said that in the majority of plants with much fewer than 500 employees, a full-time nurse often is not possible. Since considerably over half of all industrial employees are found in these smaller plants, it seems obvious that the greatest volume of additional nursing service must be made available on a part-time basis. There are various ways of arranging for part-time nursing. Sometimes several plants join together to employ a nurse or a nurse can be found who only wishes part-time work. Another solution of the problem in the small industry is the use on a part-time basis of nurses employed by local public health nursing agencies.

For the very small plant, then, part-time nursing service purchased from existing public health agencies is often a feasible plan. Very large industries already provide medical, nursing and other health services for their employees. There remains the considerable number of establishments with 300 or 500 to 1000 employees not as yet provided with nurses. These firms can finance a full-time nurse, but doubtless in most cases must depend on some part-time arrangement for medical service. It is particularly important that well-equipped nurses should be placed in these plants. They must work without nursing supervision and must carry on for considerable periods in the absence of the plant physician. Also a wide variety of duties is expected of them. Hence, an understanding of correct medical relationships, familiarity with community health resources and some knowledge of preventive medicine and industrial hygiene seems imperative for them.

Preparation of Industrial Nurses

FROM information compiled by the U. S. Public Health Service it appears that only 11% of registered nurses now employed in industry have taken any post-graduate work in public health subjects. They have learned much "on the job" but would profit by additional opportunities for study. This represents one part of the problem of preparation of nurses for industrial service.

The other part is the need for preparation of the additional nurses who gradually should be employed to serve the two-thirds of the industrial population which now have no industrial nursing service at all.

Both additional full-time industrial nurses who may be placed and also those nurses in public health agencies such as visiting nurse associations with which contracts for part-time service might be arranged will need this additional preparation. Such contracts can hardly work out satisfactorily either to the industry or the agency unless the nurses do have some industrial preparation.

In the long view, the best way to prepare industrial nurses is to strengthen all nursing education. First, superior young women should be selected as students in nursing schools. In their basic education adequate experience and theory in surgical nursing, including first-aid and if possible outpatient emergency experience, should be provided. In this basic education too, the social and health aspects of nursing should be included. After graduation, experience in general public health nursing work and special education in a university where courses in industrial hygiene and industrial nursing are available would give additional preparation needed. At present programs of study in public health nursing should consider expansion in this part of their curriculum.

To supplement preparation of nurses already employed in industry, it would seem most feasible to institute part-time courses running parallel

with present employment since it is very difficult for nurses employed in industry to get away for study. These perhaps could best be arranged as evening courses on a regional basis by state departments of health. Industrial hygiene divisions in states where these exist might cooperate with the nursing unit of the health department to do his. Extension courses from universities might also be made use of where these are available in the area. For the new nurse who must be prepared quickly for this field, who has some background of experience or theory in the public health field, but no industrial experience, short intensive courses of three or four months would seem practical. There would be advantages in having these planned in institutions where schools of public health including public health nursing courses exist and where some of the work perhaps might be taken in classes with industrial physicians and engineers. In addition, there should be special classes where application to the nursing field of the more general material can be made. Also there should be time and opportunity for observation and practice of industrial nursing.

American Association

of Industrial Physicians and Surgeons
—Constitution and By-Law Amendments Proposed to be Voted upon at the Annual Meeting, May 5-9, 1941—

CONSTITUTION:

ARTICLE V, SECTION 3: After the words "twelve directors" in line 4, insert "and a House of Delegates consisting of the Officers and members of the Board of Directors and the Presidents or legally appointed or elected delegates of Component Societies." Delete that part of Section 3 beginning with "Presidents of Component Societies" and ending with "as other directors."

ARTICLE V: Change heading to read "Officers, Directors and Governing Bodies."

ARTICLE V, SECTION 1: After the words "Second Vice-President" insert "a Managing Director" and delete the word "Secretary" in the compound word "Secretary-Treasurer."

ARTICLE V, SECTION 4: Delete entire section which will be placed in the By-Laws.

ARTICLE V, SECTION 5 becomes Section 4, and change the word "five" to "six."

BY-LAWS:

ARTICLE I, SECTION 2: Change it to read "Special meeting of the membership may be called by the President with the approval of five members of the Board of Directors, Special meetings of the Board of Directors or of the House of Delegates may be called at the discretion of the President."

ARTICLE I, SECTION 3: Insert after the words "all meetings" the words "of the members" and delete the word "Treasurer" in the compound word "Secretary-Treasurer."

ARTICLE I, SECTION 4: Delete the word "Treasurer" in the compound word "Secretary-Treasurer."

ARTICLE IV: Change heading to "Duties of Officers and Governing Bodies."

ARTICLE IV, SECTION 1: "The planning of the work of the Association; arrangements for meetings and programs and any or all other matters pertaining to the administration of the affairs of the Association shall originate in the House of Delegates but all its actions must be ratified by the Board of Directors."

ARTICLE IV, SECTION 2: "The Board of Directors shall have charge of the property and financial affairs of the Association and shall perform such duties as are prescribed by the Constitution and By-Laws and the State law governing directors of corporations. It must ratify the transactions of the House of Delegates, Committees and Boards before they can become effective."

All sections to be renumbered: Section 1 becoming Section 3, etc.

ARTICLE IV, SECTION 4: "The Managing Director shall be the executive officer of the Executive Committee and, under its supervision, during the intervals between meetings, shall manage, direct and conduct the affairs of the Association. He shall supervise and direct the activities of the Executive Secretary and shall render a report on the status of the Association to the Board of Directors at their Annual Meeting."

ARTICLE IV, SECTION 2 and 3: Delete the word "Secretary" in the Compound word "Secretary-Treasurer" and the last one in section 3 should be changed to "Managing Director."

Empyema

—Observations on Treatment—

ALBERT H. MONTGOMERY, M.D.,
Chicago

I SHALL not talk about tuberculosis empyema; I shall talk only about treatment of pyogenic empyema of the pleural cavity. I chose this because the treatment has gone around in a circle, just like most things we find in medicine that go around in a circle. The pathology is, of course, well known: the formation of pus in the pleural cavity, the pouring out of an exudate which finally masses into an abscess between the lung, diaphragm and chest wall. The organisms in most cases are streptococci or pneumococci. They differ very essentially, particularly in their mode of pathologic action. That is, in the early case of pneumococcus infection we find a thick fibrous exudate almost from the beginning; on the other hand, the streptococcus produces at first a thin exudate which, as time goes on, gradually becomes something like skim milk and then later something like whole milk. Probably 10 days after the first observation we find the streptococcus pus now resembling pneumococcus pus in that it is thick and creamy and homogenous. Occasionally, of course, we find other organisms such as influenza, or staphylococci.

Treatment of this condition which I wish to speak about has for its object removal of the pus to allow the lung to expand and obliterate the cavity. This is important because if you do not get a collapse of the cavity chronic empyema will result which is a very serious condition. There is one essential treatment and that is prophylactic treatment, which means that in the acute and subacute stages treatment should be instituted and carried out sufficiently so that this cavity is completely obliterated.

The question arises as to the proper time at which to institute drainage. We have two measures to go by. One is the character of the pus;

Read at the Fifty-First Annual Meeting of the AMERICAN ASSOCIATION OF RAILWAY SURGEONS, Chicago, September 17, 1940.

and it is not a bad thing to take some of these samples of pus, inject into a test tube and hang them up at the head of the bed. Two or three days later take another sample and you will find that if it is a streptococcic infection the pus is thicker; if it is pneumococcic, it is of the same thickness practically all the time. Therefore, by looking at these tubes containing pus it is usually easy to tell the time when the pus gets thick like cream, and that is the indication to open the chest wall. Why? Because you know that when there is that much fibrin in the exudate there is bound to be fixation of the lung; that the mediastinum is fixed by a thick fibrinous covering. If you proceed to open the chest before this point is reached you would have the danger of a pushing over of the mediastinum with interference of action of the other lung and of the heart, and sometimes, particularly in the streptococcic cases, you may have sudden collapse of the patient on the table. Therefore, the time to open is when the mediastinum is fixed.

There is another thing to go by and that is the character of the organism. If you find there is pneumococcus present, you can be almost sure that you open the chest almost any time. If you find streptococci, you must proceed with caution. The reason for this is that today some of the sulfonamide preparations are showing a queer change in the character of the pus. Heretofore it has been usually very steady as a homogenous exudate, but we find since then that the pus assumes such a character that the fibrin precipitates and after standing a short while you find a thin supernatant fluid and at the bottom a thick fibrin. The same thing occurs in the chest and at one time the aspirating needle picks up thick material but above that the fluid is thin, so it depends where you puncture as to what kind of fluid you get.

PERHAPS the simplest and oldest method of treatment is putting a needle in or a trocar. It is felt that simple drainage through a needle or a suction apparatus is of value for diagnosis primarily and secondly it is often of use in these cases of dense pneumothorax that occur where if you do not act promptly the patient's heart action is so embarrassed that the patient dies unless relief is given promptly.

The objection to aspiration in the treatment of empyema is that it is a very prolonged affair. It takes sometimes three or four months of treatment to get results, and even then it is not always successful, and then you have to resort to drainage. I am not an advocate of aspiration, but I admit that it will work sometimes and it has a place in treatment of empyema.

If you are going to institute active drainage, there are two schools of thought. One believes in the closed method; that is, the insertion of a tube under air-tight conditions placed in the interspace and draining into a water trap of some kind. This type of treatment will work, but it is not as satisfactory as I would like to have it.

The best treatment is the tube in the chest wall, and you can do this safely if you wait until the cavity is well established. I believe you should make a good-sized opening in the chest wall, and that usually means a rib resection, not necessarily at the most dependent part of the cavity. It will drain all right two or three inches above, and if there is a good-sized opening drainage should be good. This can be done very satisfactorily, even in children, under local anesthesia. You can take out a piece of rib, put in a tube, suture the muscles all together with one or two good-sized silkworm gut sutures so that the pus will not infiltrate out through the muscle layers. Another thing to remember is this: If you want the tube to visualize on the x-ray, use red-rubber tubing; this visualizes well and you will know how far in it is in the chest. Also always remember to put a safety pin on the tube or some form of fixation so that the tube will not slip into the chest.

As to irrigation, I think it has only one place and that is when the tube gets blocked. If it gets blocked it can be washed out with salt solution and drainage will be resumed. Dakin's solution has only one use and that is if you think you can dissolve fibrin a little faster. It is troublesome, but you can use it if the patient does not have a fistula. I do not believe that it sterilizes the cavity, and I do not believe that it shortens the period of morbidity.

It is often advisable for the first week to drain these patients through a closed system, but we think it advisable at the end of a week to cut open the chest wall, allow the drainage to drain into a dressing and allow the patient to get up. Such patients do much better if they are allowed to get around a little.

It is also important to know how long to leave the tube in. One way to tell whether it is time to take the tube out is to turn the patient over with the affected side upwards, and put in a syringe full of salt solution, observing how much you can put in before it overflows. I think it is a good thing to do this because you know that if the cavity will contain 10 to 15 cc. you are safe in pulling out the tube. This is important because if you pull the tube out too early the hole will clear up but the patient will come back in four or five months with massive empyema, and now he has thick, tough walls and the treatment of the condition is serious and difficult.

LET me say in conclusion that I believe aspiration is for diagnosis and for the occasional treatment of a pyopneumothorax. I think, however, in practically all patients, this can be better done by a trocar inserted between the ribs, containing a catheter and allowed to remain there and it will soon become open drainage. I think that is the best treatment for pyopneumothorax. It is very simple to do at the bedside and is very satisfactory. So far as drainage is concerned, I do not believe that closed drainage remains closed; it is more difficult to handle and the drainage is not as good. I believe we have come to the place we were before the last war and that is to wait until the cavity is well established, make a good-sized opening, put in a tube and allow it to drain until the cavity is closed.

Industrial Medicine
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Forum

AT THE opening of the first session of the Third Annual Congress on Industrial Health, at Chicago, January 13, 1941, the statement was made that, prior to the inauguration of the A.M.A. Council on Industrial Health in 1937, there was no forum where those interested in industrial health might assemble for discussion of their common problems. The sense of loyalty to the A.M.A. Council which distinguishes the statement is, of course, commendable. But the statement is authoritative only in so far as it means that there was no forum from the standpoint of the A.M.A. For the fact is that there *was* a forum. It was, however, not only not fostered by the A.M.A., but, indeed, was hardly even recognized. Not because of the nature or circumstances of the forum itself, but rather because the matters and things to be considered there had not been accepted as having the professional standing to be discussed in a place of dignity. The generic term was not "industrial health," but "industrial medicine." And the general attitude of organized medicine toward "industrial medicine" is too well known, and by many, no doubt, too well remembered, to need further comment.

The statement referred to is not intrinsically important. In equivalent meaning it has been made before and probably will be made again — without any great harm to the facts. The principal significance which attaches to it on this occasion is by way of its timely apposition to the forthcoming Twenty-Sixth Annual Meeting of the forum which was organized in 1916, in Detroit, and has continued without interruption to the present time of its announcement, for the week of May 5-9, inclusive, at Pittsburgh, of a program of presentations and discussions on the subject of industrial health unequaled under any aegis.

This is the program of the post-graduate "Institute of Industrial Medicine and Industrial Hygiene" which the Annual Meetings of the American Association of Industrial Physicians and Surgeons and the American Industrial Hygiene Association together will comprise. There is a summary of it on page 10 of this issue; next month it will be published in full. Meanwhile, in tentative completion, it is being mailed to readers of Industrial Medicine, in order that the impact of its real interest and value to everyone — physician, surgeon, hygienist, nurse, engineer, executive — who is interested in industrial medicine, may overbear all other plans and conveniences, and eventuate in attendance.

In the history of industrial medicine, there have been many programs of excellence and importance, but never one like this. It is a masterpiece in every respect in which a program can excel — selection and timeliness of subjects, authoritativeness of presentations, arrangements, and the many other things which are so well known to program committees and, because they are well arranged, so little noticed by anyone else.

But behind the superlative quality of this schedule, is the fact that such a program is possible only under circumstances and in a setting where a cumulative experience is being expressed, where the touch of familiarity assures an unconscious verity, where the masterpiece is indeed the "piece of the master." In other words there *was* a forum, and it was in that forum, over the quarter-century in which it was the center of industrial-medical interest, that the knowledge was developed and the experience secured which have made such a program as the present one possible. There is a great deal more in it than its words and figures; there is the enterprise and courage and skill and sense which brought industrial medicine up to such a high point of successful development as to make much more than a euphemism out of the circumstance that industrial "health" has followed, and is the result of, 25 years of industrial "medicine."

THERE'S another evidence, on page 11, of the existence, the background, of an institution such as the A. A. I. P. & S. has been. It is the coming into being of the American Conference on Industrial Health, with the objects and purposes which are there detailed. The natural and inevitable consequence of the fact that industrial health is *industrial*, it, nevertheless, could only develop from the strong basis of the medical integrity of the "health" successfully established before its appeal would be respected by the part which is "industrial." In other words, here, too, there was the need of more than purely medical experience. There was the need of just such things as have been available in the forum which, as noted, was opened in 1916 at Detroit, and has never closed.

INDUSTRIAL HEALTH AND DISEASE

The Status and Function of the Industrial Physician

LLOYD NOLAND, M.D.,
Tennessee Coal, Iron & Railroad Company,
Fairfield, Alabama

THE industrial physician is generally regarded as a product of very recent times, for most certainly greatest progress in this specialty has been made in the past 50 years. It is interesting to note, however, that Hippocrates, who lived in the fifth century before Christ, described many diseases associated with particular trades, such as metalworkers, fullers, etc. Other ancient writers also contributed, notably Paracelsus, who wrote voluminously on diseases and accidents of miners. Bernardino Ramazzini, 1633-1714, who wrote DeMorbis Artificum Diatraba (Diseases of Tradesmen), published in 1700, is regarded as the founder of industrial medicine. Ramazzini's writings covered the hazards connected with a great number of occupations of that time and described both preventive measures and treatments in a remarkably able manner.

Read before the Medical Association of Georgia, Savannah, April 24, 1940; published in *J. M. A. Georgia*, November, 1940.

The development of the factory system in England in the latter part of the eighteenth century brought many evils, for industrial hygiene was unknown, and child labor, very long hours, poor lighting, lack of ventilation, unguarded machinery, etc., exacted so tremendous a toll that public opinion forced the passage of the Factory Act in 1833. Under this act a factory commission consisting of three members was appointed, notable among whom were Edwin Chadwick and Dr. Southwood Smith. This commission introduced a system of inspection and reporting that resulted in numerous reforms.

Since 1887, when the first state law requiring certain safety measures was passed in the United States, various states have enacted laws designed to provide safety and good sanitation for the workman. Since 1912 most of the states have enacted compensation laws covering accidental injury in course of employment, and a number now have laws providing compensation for diseases associated with certain industries.

Long before the passage of these laws, however, many farsighted leaders of industry had realized that the good health and welfare of the workman was a vital factor in successful operation and many able physicians were devoting their every effort toward the study of the various factors involved, and their solution.

The construction of the Panama Canal, 1904-1914, offered the greatest opportunity up to that time for a demonstration of what could be done to protect a force of more than 40,000 workmen under what were in the beginning, most adverse conditions. The success achieved there through able sanitary work, hospitalization, housing, proper feeding, and close supervision of working conditions, set a standard for all industry. General Gorgas and his staff have generally been regarded as sanitarians, but, as a matter of fact, they were able industrial physicians.

For some peculiar reason there was for many years a tendency on the part of medical men in general to rather look down on those of their professional brethren who gave a part or all of their time to industry. The railroad surgeon, or the contract doctor as he was often called, was regarded as only a bonesetter or laceration repairer. For this same queer

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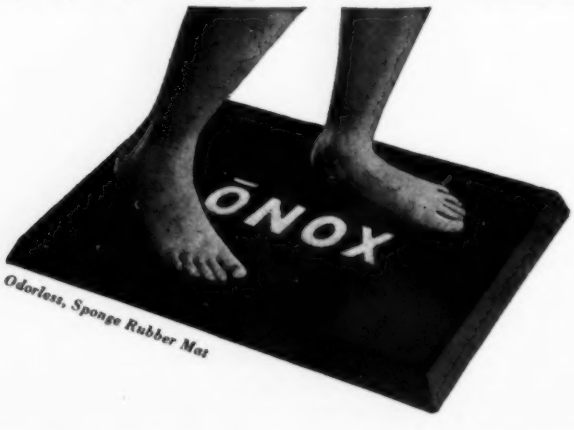

reason the surgery of trauma was deemed rather unimportant, if not a wee bit degrading.

Perhaps the rapid increase in our speed of living has had much to do with changing these older conceptions, for in recent years huge emphasis has been placed on the proper care of the injured. A single factor —the development of the automobile with its consequent trail of destruction, has changed the practice of almost every American hospital, and with this has come tremendous improvement in the training of surgeons in the handling of trauma. With serious injury and sudden death constantly increasing on our streets and highways, industry has been quietly, efficiently and steadily reducing the hazards of the workman, and to this great work the industrial physician has largely contributed. With contribution has come wide recognition of the value of this special line of medical practice, marked improvement in facilities for advanced training, and the organization of special societies devoted to its study and the dissemination of special knowledge.

The tremendous scope and variety of industry in the United States at the present time has made necessary much specialization among industrial physicians; for instance, the problems of the dye and chemical industries are far removed from those of coal mining; the textile worker's environment and duties cannot be compared to those of the meat packer; nor can the risks of the hard rockworker be judged by those of the shipyard employee, and so on ad infinitum. It is manifestly impossible, therefore, in a paper of limited scope to discuss all of the problems of the physician in industry. We can attempt only generalities.

BROADLY speaking, the surgery of industry is in no way different from present day general surgery.

Perhaps the greatest requisites for success in industrial practice involve the acquiring of a broad and comprehensive knowledge of all phases of a particular industry, particularly the conditions under which men work, including such vital factors as the fatigue element, temperature exposures, ventilation and lighting. Careful study must be given to particular hazards, such as gases, metallic poisons, dusts, chemical compounds, etc. Study and consideration must also be given to such vital matters of routine sanitation as drinking water properly protected and at proper temperature and easily accessible, and toilet and washroom facilities.

The physician's office, its equipment and his assistants, are of vital importance. He should have every facility for confidential talk and advice. His examination and treatment rooms should be well-equipped and maintained. He should have a well-planned and well-kept system of records. Sufficient space should be available for pre-employment and periodic physical examinations to be conducted with a degree of privacy and high efficiency, and his assistants, both professional and lay, should be carefully selected and trained. The necessity for elaborate diagnostic and laboratory equipment must always be judged by the demands of the particular industry.

Adequate first aid for the injured is always of primary importance in any industry, and careful consideration must always be given to the selection and placing of proper equipment and to the thorough training, if not of all, of at least a sufficient number of key employees in such essentials as artificial respiration, hemorrhage control, and the mechanics involved in lifting, transportation and protection of the seriously injured and shocked. What not to do before the arrival of the doctor is a vital part of this training.

Knowledge of a particular industry should go hand in hand with acquaintance of the men employed, if possible from the head of the industry to its almost humble employee, for the human factor is, after all, the most important problem. If the physician is the man he should be, such acquaintance will bring respect, confidence and trust, without which success is impossible, for the doctor will be called on for many decisions vitally affecting the welfare of many employees.

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Pre-employment examinations are now generally accepted as routine and must be most carefully and tactfully conducted, always with full knowledge of the particular work for which the individual is being employed, for final decision must in many instances be based on this knowledge.

Close coperation with the employment office in such a way that suggestions may be readily considered is absolutely necessary.

Many industries have wisely adopted some system of periodic examination covering all employees, and in addition many have systems of disability and old age retirement. The findings and recommendations of the examining physician are the all-important factors on which decision of management must be made, often seriously affecting the fortunes of the particular employee. Tact, sound judgment and kindliness, plus a built-up trust in the doctor, will go a long way in preventing any employee from feeling that he has been wronged, a not infrequent reaction in the past.

Much the same burden is placed on the shoulders of the industrial physician in making final report as to the presence, degree of, or absence of disability following injury incurred in line of duty. Scrupulous honesty, sound judgment and courage, based on broad knowledge and experience, will always win approval of both employer and employee, for, after all, justice is what both management and labor require in the handling of compensation cases. The officials of any great industry would immediately and properly distrust the doctor whom they suspect of being anything but absolutely fair to both the industry and the employee. In most industries we believe that the policy is to give the benefit of any doubt to the employee.

One of the most disagreeable duties of the doctor in industry is the necessity of giving court testimony from time to time. Long experience has definitely fixed certain points in our minds: first and foremost, one must be absolutely certain of the facts involved; after that, if temper is controlled and any show of bias is avoided, the rest is easy. Physicians are regarded as fair game by members of the legal profession, but plain speaking, avoidance of technical terms, and absolute honesty will always disarm the otherwise embarrassing lawyer and bring approval of any able judge, jury, or compensation commission.

Many industries are now of such large size and wide scope that large medical organizations are necessary. Some own and operate their own hospitals and have a sufficient personnel to cover all of the specialties; others are so small as to require only the part-time service of a single physician.

In many industries the medical work of the physician is strictly limited to the care of the injured employee and to matters concerning working conditions; others provide for consultation and advice covering any ailment of the employee; while a limited number extend their medical services to the families of their employees as well as to the men themselves.

Decision as to the scope of any medical service must be made after careful consideration of many factors, perhaps the most important being the type of man employed in the particular industry and the average income earned. Also worthy of study are such questions as the quality of local public health work, the accessibility of good medical facilities in financial reach of the workman, the geographic distribution of the force, and always the attitude of the local profession. There can be no possible question of the fact that intimate knowledge on the part of the physician of the living conditions and family problems of the employee is of tremendous value in the establishment of a steady and contented working force, for the man who knows that illness in his family is being properly handled without great financial burden can be counted on to produce steadily and to avoid risk of injury to himself, his fellow workmen, or the machine he is using.

In this present age of ours with so much agitation and propaganda in circulation, it is often difficult for the average workman to know just whom to trust. The physician who guards the workman's safety, who treats his illness or injury, who possibly treats and advises his family, has a wonderful opportunity in the formation and safeguarding of ideal employer-employee relations, particularly if the physician has, as he always should, constant access to executive management.

The practice of industrial medicine has steadily increased in popularity, for it opens a field of endeavor to many able men to whom the financial or competitive side of medicine does not appeal.

The status of the well-trained industrial physician is thoroughly established. He has the respect and confidence of the medical profession in general, for his chosen specialty has steadily increased in importance, and scientific attainment necessary for success can be most favorably compared to any other branch of medicine.

Management of Minor Industrial Injuries

Donald C. Conzett, M.D.,
Dubuque, Iowa

WEBSTER defines management as "the judicious use of means to accomplish an end; skillful treatment." This definition of management applied to industrial injuries gives rise to problems which are of real importance to physicians.

At the time the first compensation laws were enacted in 1911, medical care of injured employees was in a chaotic state. Laws on the statute books of the individual states concerning employer-employee relationship were of the type commonly designated as "employers liability laws." This employer liability system was merely an improvement on English law which in turn had its basis on the principles of the old Roman law applying between strangers, not as between employer and employee. Under this code an employer was liable only for the results of his own personal wrong doing; negligence on the workman's part or on the part of a fellow workman played no part in recovery for injury.

It is obvious that, with such a system, many injustices occurred in legitimate cases, and it was not long until the "employer liability" legislation became effective. Again errors appeared and it became necessary for the injured workers to employ legal talent in controversial or disputed cases. The incapacitated worker was unable to pay his attorney a retainer fee; hence a system of contingent fees arose. The unhappy circumstances in this arrangement are all too obvious to need explanation; suffice it to say that all too frequently the injured found himself wondering at the time of settlement who really had been injured. Strangely enough through all these years nobody had thought about who might have to pay the doctor. That individual most responsible for returning the injured man to work was blithely shelved and disregarded while the courts rang with legalistic bombast concerning monetary settlement. The injured man was expected to provide himself with medical care. However, if settlement was made and a decision rendered showing negligence (and what attorney could not somehow inject that thought!) the doctor booked his charges under experience. The busy surgeon, he who was probably best qualified by skill and experience, was not attracted to such work; consequently medical care was little better than the rules governing it.

Today, however, the situation is vastly improved. From a system wherein the lawyer got much and the doctor little, a plan now operates wherein the lawyer complains of his negligible returns while the doctors, according to Best's Insurance Reports for 1937, receive, along with hospitals, between 45 and 50 million dollars annually. We are in a position far superior to that of our predecessors; consequently the obligations of management must be met intelligently.

All states, save two, have workmen's compensation laws but in no two of these jurisdictions are the laws the same. Uniformity of law throughout the nation would not be practical, for working and living conditions vary in different sections as do the types of labor. Iowa is predominantly agricultural and its trend is reflected in the constituency of the governing bodies. The Iowa Assembly in the past has not been overly receptive to increases in compensation payments either for workmen's disabilities or medical care. Recently, however, increases in medical allowances have provided financial impetus to the physician to make this work more attractive.

What then does medical care of employees entail under existing laws in this state? In the first place,

Presented before the Eighty-Ninth Annual Session, Iowa State Medical Society, Des Moines, May 1, 2 and 3, 1940; published in *J. Iowa State Med. Soc.*, November, 1940.

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Iowa as yet does not recognize occupational diseases in its compensation set-up. We are, therefore, limited to care of employees injured in the course of their employment. Further, the physician has a condition differing from the usual patient-physician relationship, for in compensation cases he has a three-fold responsibility: first and fundamentally to the patient, but because he is now working under conditions governed by law, a responsibility exists to the employer and his insurance carrier, and to the commissioner. This does not mean that the responsibility toward the individual should be lessened; it means that even greater attention must be given to him, because the sooner the man is returned to his work fully recovered the less time is lost to the company and the less is the financial outlay required of the insurance carrier.

Few physicians are wilfully negligent in handling compensation cases. Most disputes arise from the physician's lack of knowledge of existing regulations. A question frequently asked is that regarding choice of physicians. In a personal communication from the Commissioner in answer to this question he writes as follows: "With reference to who may exercise the choice or selection of physician, I beg to advise the Iowa Workmen's Compensation Law provides that the employer shall furnish reasonable and competent medical and hospital services and supplies. However, the law does not expressly provide who has the choice. Our department has therefore held that in the first instance, it is fair to presume it was the legislative intent that the employer has the right to make the choice, assuming that the employee expects the employer to pay therefor in the limits prescribed by the law, which is not to exceed $600.00. On the other hand if the employee does not see fit to accept the physician chosen by the employer, then and in such case, the employee has the right to make his own choice but at his own expense. Assuming that the employee makes a choice at his own expense but the employer is of the opinion that the physician who is rendering service selected by the employee is not accomplishing the desired result, then and in such case, the employer may again tender medical service to the employee, and if the employee persists in using a physician when it is ultimately shown that the physician thus chosen by the employee is incompetent, then the Commissioner in passing upon compensation benefits will exercise the right to take such matters into consideration in determining the extent of disability."

The bugbear that deters many physicians from handling compensation work is the matter of records. The experiences of the World War with its endless, and seemingly needless, paper work is too recent in the minds of many to bother with this tedium. There is no denying that these records are a boresome but necessary chore if compensation practice is to be adequately handled.

Recently, at the request of an insurance company, I saw a young man who had received a penetrating injury to his forearm when he fell on an ice pick 10 weeks prior to my examination. He had had excellent treatment, for the wounds had healed promptly with no evidence of infection even though the wound had extended through the entire thickness of the forearm. However, his attendant had ignored or else not elicited a history of tingling in the ring and little fingers. Thereupon the physician had filed his final report as no permanent disability. Ten weeks after injury this boy had a complete sensory loss over the volar surface of these two fingers, atrophy of the adjacent palm and markedly diminished grip. The company had to reopen the file and prepare to make payment far in excess of their established reserve for this case.

Another boy was recently seen for examination of a supposed hand injury prior to a hearing before the Commissioner's deputy. His injury had been a minimal puncture wound from which a superficial infection developed. Adequate treatment, however, had produced a complete re-

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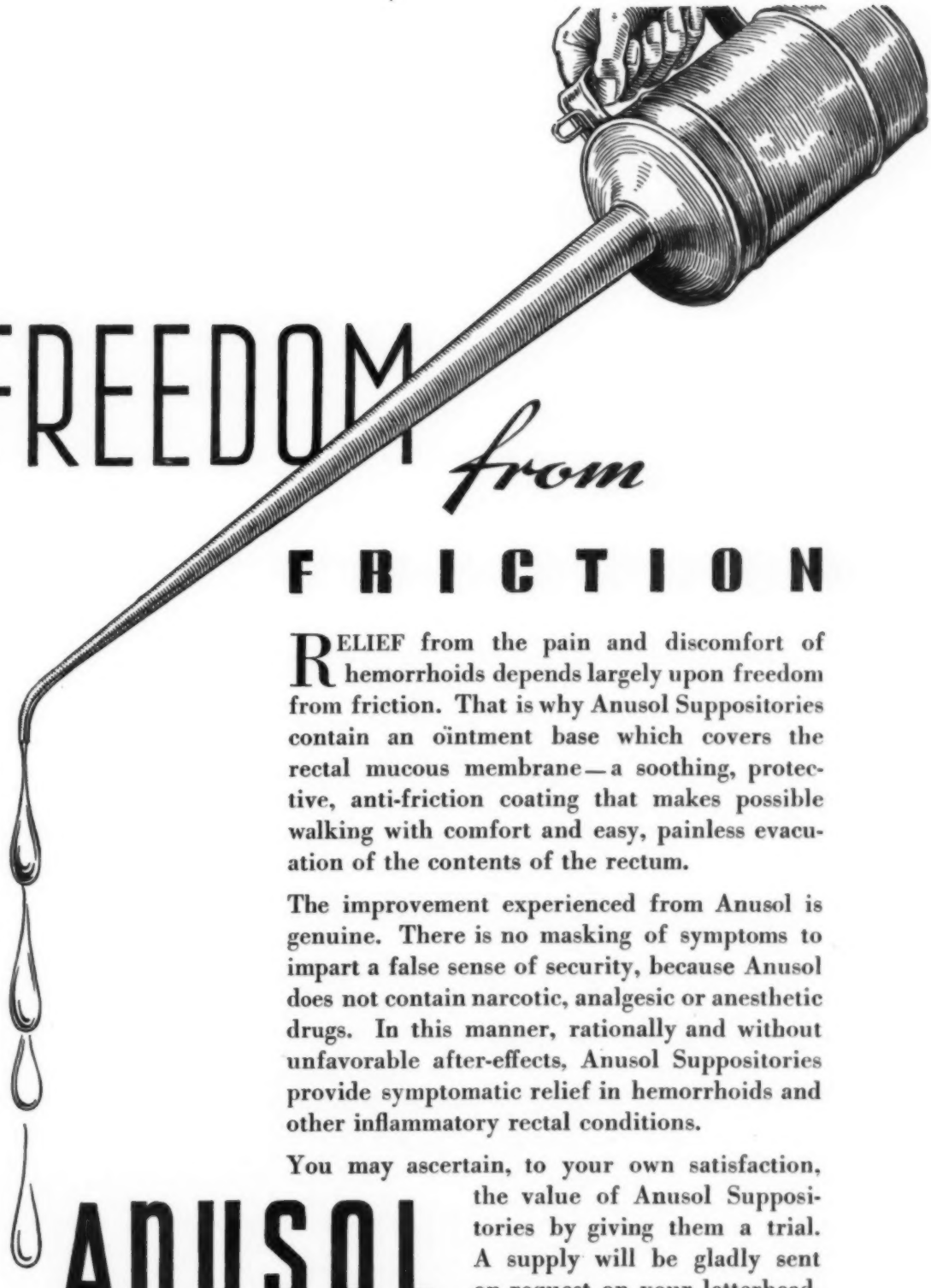

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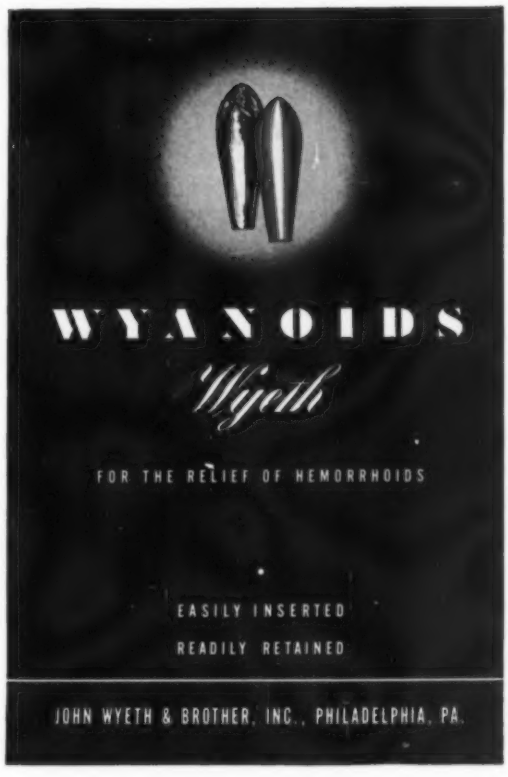

covery. Nevertheless, anxious to collect damages, this boy had employed an attorney who had built up a bizarre case with grotesque neurologic phenomena. The case, as the hearing progressed, was obviously one of malingering but the defense suffered a distinct setback when the record was found to be virtually blank. The attending surgeon had rendered excellent care but there were no records to substantiate his services. His duty had been done only in part.

No doctor can be too careful of his records in compensation cases, if not for the sake of the company, at least for his own protection. Many of these injured employees do not have the loyalty of the private patient; occasionally they want to profit through their misfortune and a doctor's negligence may be an excellent means to that end. The preliminary report of the accident by the physician is the only picture of the injured man which the insurance company sees. From it they must determine if the man has been sufficiently injured to come under the benefits of the compensation law. They must know the length of that disability and also whether there will be any permanent defects. All of these factors unite to allow them to set up their reserve, an item we will refer to later. Next, the Commissioner must receive these reports, for he must be satisfied that the injured employee has been justly dealt with and that he receives the compensation which is provided by the law. Regarding the reserve, G. Lester Marston of the American Mutual Liability Insurance Company gives an excellent description and I quote him: "If you were to build a house and your architect told you it would cost 10,000 dollars, you would see to it that you had that sum of money in the bank to pay for it. The financing of a compensation case is no different from that of financing a house, and instead of relying upon the plans of architects we must rely on doctors and surgeons to furnish specifications in the form of medical reports in order that the potential cost of that case can be properly determined. Each case is a separate bookkeeping account against which amounts are drawn for the purpose of making compensation, medical and expense payments. In order that this account may at all times be solvent, we rely to a large extent upon your full cooperation as respects furnishing us with the information requested in the reports."

Probably all of us have filled out hundreds of insurance blanks but we have all erred either through haste or lassitude to complete these blanks accurately, leaving them to the office force while we dashed out to play golf. We must remember that these records are in addition to being the picture of the injured, also the expression of the quality of our work to the insurance company. Most companies now use a standard form and the questions are clearly stated. The exact dates of injury and of beginning disability are necessary in determining compensation due the injured. The description of the injury is likewise of great importance, for on this factor depends the evaluation of the case. Of equal importance is the question regarding permanent defect, for from this answer the company must arrive at an estimate of probable payment of permanent disability.

There are no specific regulations regarding treatment and it is well that there are none, for we all know that equally good results may be achieved through the use of varied methods. It is only necessary that the injured be treated to the satisfaction of all concerned and returned to work as soon as possible. Psychology plays a large role because employees occasionally misinterpret the law and think they have damages due them. Here the physician, while treating the injured, can explain that the compensation law is designed to care for him and his family during his enforced disability and, further, to compensate him for any defect that may result because of his injury, and is so devised that his payment is automatic and he need not employ legal aid to justify his claim.

The physician doing industrial work must be unqualifiedly impartial; if he leans toward the employee in the prolongation of his disability or bends in the employer's direction in sending the injured back to work before he is ready, he is dishonest in his duty. Mr. Clarkson, the Commissioner, has given his interpretation of the physician's attitude toward this work as follows: "The physician of all persons is in a better position to know when it is reasonably safe for the man to return to work, for he is in a position to know what effect the work may or may not have upon the injured parts." There are inadequacies in the present compensation system. Utopia is never reached but physicians can improve the care of injured employees if they will give the same thoroughness of attention to them that they give to their private patients. This, coupled with an unswerving honesty to both parties concerned, the injured and the employer, will automatically eradicate many misunderstandings.

In summary, the Workmen's Compensation Law is a workable arrangement whereby the injured receives adequate benefits and the physician reasonable fees. Demands on the physician, in the form of records, are tedious but essential to proper execution of the plan. Iowa physicians should familiarize themselves with the law and its regulations so that they may expedite the care of the industrially injured.

Relation Between Corrosion and Menstruation?

—Certain observations and findings of causes tending to stimulate electrolysis and corrosion in electrical products—

HELEN L. BYRNES, R.N.,
Standard Transformer Corporation, Chicago

IN THE profession of industrial nursing, situations present themselves from time to time that can be accepted as a challenge to one's intelligence and ingenuity and keep one striving to better acquaint herself with technicalities and procedures in overcoming difficulties that arise, rather than permitting her to feel that this particular profession is uninteresting and dull.

In our plant employing 300 people, of whom the majority are female help, problems other than those of a conventional nature have arisen. By virtue of defects in quality or workmanship evidencing themselves in the sample production department of our small transformers for industrial and commercial application, new and interesting queries have been brought to attention.

So as to acquaint readers with our problem, it might be well to review in a non-technical manner the "where and why fors" of a small transformer so that the production procedure under discussion may be visualized. A transformer in the first instance is an electrical device consisting of many turns of insulated copper wire assembled over an iron core. Electrical energy is passed through this first winding, creating a magnetic field that is induced in the iron core of the transformer, and then in the opposite way the required or reduced energy is withdrawn from a second winding wound directly over the first which has this electrical energy transferred to it by the magnetic flux or lines of force set up within the field originally excited by the application of current on the primary or first winding.

In the production of this rather simple electrical unit, a paper core of acid-free material is wound as a base of the coil upon which many hundreds or even thousands of turns of fine enameled copper wire are laid side by side in layers to build it up to the required technical specification. After each layer is wound, a material of either insulated paper or cloth is inserted to provide in-

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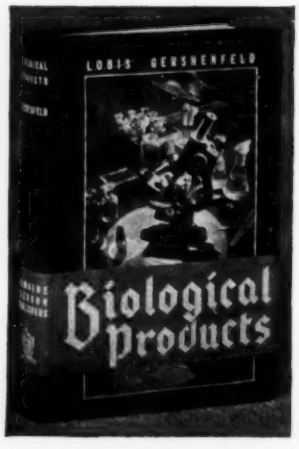

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sulation between layers so that the wires do not touch one another and create a short circuit. After the coil is completely wound, it is necessary for our operators to skin the enamel off the start and finish of the winding and to place a flexible lead wire on these ends and solder the connection securely and then tape them down under a wrapper which is used as the finishing wrapper. Just at that point is where the nursing division of our plant was called in to solve a problem that perplexed the minds of our highly skilled technical department.

We have found that upon the application of direct current; while acid-free material was used in the production of the coil, electrolysis and corrosion started to take place. Our engineering department went so far as to have lunching at the benches dispensed with because they found that some of our employees in the sample-winding department used a little too much salt on their sandwiches, which the engineering department in turn believed was detrimental to the best interests of our sample production.

The management also had the peanut vending machines withdrawn from the plant because the salt adhered to the employees' hands and consequently worked into the coils during the period of fabrication.

With precautions that appeared even as minute as these, our difficulties while they decreased, still were prevalent. After talking with the engineering department and several of the managerial heads, the problem was presented to me to effect some sort of research with respect to determining whether or not the perspiration liberated from an operator's hands could in any way have caused the difficulties we were encountering, such as electrolysis.

A situation was called to the attention of one of the executives, where a manufacturer of metal kitchen cabinets was obliged to effect complete replacement of an entire kitchen assembly on account of finger prints which were obviously put on while turning the stock in the spray booth to effect a change in direction of spraying. After a period of time, the paint virtually lifted and peeled off from the spots that represented the complete span of the five fingers of the operator's hand as he used it to revolve this piece of metal. It was conclusively proved in this instance that the operator involved was the possessor of a complex sex mechanism and that the perspiration accumulated on his finger tips was definitely acidic, and after determining the cause of difficulties, his removal was necessitated from that particular operation.

Having learned that situations of this type arise at infrequent intervals, we endeavored to determine whether or not those sample-winders of ours affected the quality of the samples produced by virtue of their physical condition. It was believed, then, that during the menstrual period of our operators, the chemical components of perspiration varied to such an extent that corrosion was actually stimulated by those operators found to be menstruating at the time of the production of a given article. These conclusions, while I have not yet had an opportunity of actually proving them to the most minute detail, are believed to be well founded.

During the course of the last few months, it has been my duty to contact several medical authorities to complete evidence of the fact that body secretions of a woman during her monthly cycle or during pregnancy, change to the extent of actually affecting small electrical appliances and devices such as we produce. My purpose in presenting this is to obtain from your readers information and advice relative to confirming or discrediting our theory relative to the effect on our products by virtue of the aforementioned observations. Personally, I would like to be helpful in exploiting this field of thought, and I solicit correspondence from other members of our profession with problems of a like nature.

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A New, Effective Wet Dressing Solution

—Clinical Studies on 50 Patients with Common Dermatoses—

OSCAR L. LEVIN, M.D., *and* HOWARD T. BEHRMAN, M.D.,
New York

AS THE complex phases of modern dermatological practice are continuously being clarified, accurate diagnostic methods and practical therapeutic management of the more common skin disorders by the physician are becoming increasingly important. Although it is recognized that the precise diagnosis of cutaneous affections is an essential factor in their efficacious treatment, it is the purpose of this paper to deal only with a practical procedure of therapy with particular reference to the employment of wet dressings as an initial step.

There is little question that disorders of the skin and their treatment are gaining wider attention in medicine today. A survey of recent statistics showed that in industry alone as much as 65% of all occupational disease was due to dermatitis —resulting in a loss of time amounting to four million dollars a year.[1] This figure is overwhelming, and tends to lay stress upon the value of any therapeutic measure which will bring the cutaneous condition under control within the shortest period of time.

It might be well at this point to make a differentiation between the terms dermatitis and dermatosis.[2] In industry, an occupational dermatitis includes the entire group of contact dermatitides in which the anatomical lesion is an intraepidermal edema. The reaction here is relatively delayed as compared with the reaction in which the corium is directly concerned, and the noxious substance enters the vascular system directly. In the epidermal form of sensitivity covered by the term dermatitis, the hereditary or familial element is generally absent.

Where the medium of absorption, on the other hand, may not always be the skin, and yet where the skin may be secondarily affected, also in the course of, or arising out of, work or occupation, the term occupational dermatosis is employed. The simplest statement of definition would be that dermatosis is a pathological condition of the skin without reference to cause, and that dermatitis is an inflamatory condition of the skin due to a contact agent.

Treatment of Dermatitis

DERMATITIS is characterized by an exudative inflammation of the skin demonstrating clinical phenomena which represent histopathological changes. It presents a definite clinical entity whose course often varies. Typical cases usually begin with itching or slight burning, and

erythema of the skin. The involved areas rapidly become edematous and covered with papules and vesicles which may dry or rupture to form crusts.

In the local therapeutic management of dermatitis, topical remedies are the favored agents. The rational selection of a pharmaceutical depends upon the stage of inflammation of the skin. In the acutely inflamed lesion with erythema, slight elevation of the epidermis, possible vesiculation or bullous formation, the remedy of choice is a wet dressing. The comforting and soothing qualities of this application canot be overemphasized. When solutions are properly prepared and administered, they have definite beneficial effects. They may be antipruritic, cooling, and sedative while at the same time allowing proper drainage and cleanliness. In employing wet applications, care should be exercised to keep the dressings continuously moist and not, as so often happens, allowed to dry. Unless they are changed regularly and kept wet, they may defeat their own purpose. In certain types of cutaneous disease, powders, lotions or pastes may be employed. As a rule, these are of greater value in the dry and desquamative stages.

In a recent series of 50 office cases of dermal affections, we prescribed wet dressings to be applied for 30 minutes, three to five times daily, depending upon the severity of the condition, as the initial therapeutic procedure. In some cases only wet dressings were given; in others they were alternated with lotions or pastes (see below).

Burow's Solution

IN THE past, we have used Burow's solution of aluminum acetate for wet applications with good results but with occasional local irritation. A recent report in the literature by Combes[3] is of comprehensive nature and explains the inconsistent action of this solution. Combes observed that on numerous occasions the Burow's solution caused irritation, even when used in dilution of 1—10. Noting that even official compendiums gave varying formulas for Burow's, he collected samples from several sources and examined them for variation in their preparation and composition. He found variations in their pH but felt that these differences were not great enough to account for any irritation. It was next considered possible that the free lead acetate might be the responsible factor, because of its astringent action or due to some idiosyncrasy on the part of the patient. He cited Hammet's[4] findings that "lead has an inhibiting action on the local repair and growth of the skin by stopping mitosis through the fixation of the lead by the sulfydryl radicals present in the epiderm. Since sulfur is necessary for the normal development of the epidermis, this deprivation would interfere with the recuperative process following inflammation." As a result of further investigation, it was demonstrated that in all preparations of the completed Burow's solution made according to the *National Formulary* specifications, lead acetate would be present in excess. Combes suggested revision of the *National Formulary* procedure.

A New Wet Dressing Solution; Lead Free and Stable

RECENTLY we learned of a new wet dressing resembling Burow's solution, and prepared from a set of two tablets. When these tablets are crushed and mixed with a pint of water, the solution is ready for immediate use. The advantages of this new solution over Burow's were at once apparent. First, it contained no lead. Next, it offered stability because fresh solutions are made up as needed—the tablets themselves being unaffected by heat, dampness or light. The dosage and the concentration of the ingredients are always constant. Because of the small size of the tablets and the ease of preparing solutions, patients have less difficulty in carrying out instructions. The principal ingredient of this new wet dressing solution is aluminum subacetate, in a 0.5% concentration and with a pH of 4.6. Its chemotherapeutic action is well established. In an aqueous solution it exhibits astringent, antiphlogistic, and antiseptic action. Being astringent, the solution exerts beneficial action toward lessening exudation through its ability to coagulate the albumin in the skin tissues and fluids. The basic constituents of the solution consist of the sulfates of aluminum and calcium, the acetate and subacetate of calcium and aluminum and acetic acid.

Summary and Conclusions

WET dressing solutions have generally proved themselves efficacious in industrial medicine for the treatment of wounds, bruises, certain types of dermatitis, and various phases of tissue inflammation. Because of its stronger astringent and antiseptic action, we found this aluminum subacetate solution to act more rapidly than solutions such as boric acid or aqueous magnesium sulphate salts. In our series of 50 dermatological cases, we observed no untoward reaction from this new wet dressing. Its stability and ease of preparation further augment its value. We have found it most useful during the early stages of contact dermatitis or in various cutaneous pyogenic infections. However, this solution may be used whenever a wet dressing is indicated.

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TABLE I

Case	Age	Sex	Color	Diagnosis	Description of Lesions	Course and Therapy
37. A. S.	48	M	W	Carbuncle on left buttock Duration 2 weeks	Carbuncle—size of lemon	1st Day—Continuous hot wet dressings. 2nd Day—Still painful. Tense. 4th Day—Discharging pus from several openings. Bichloride of mercury salve at night. Dressings every two hours for 15-30 minutes. 8th Day—Still discharging. Slough removed with forceps. Surrounding skin covered with weak ammoniate of mercury ung. Wet dressings 30 min. 3 x daily. 15th Day—Slough out. Ulceration much smaller. 27th Day—Superficial ulceration. 42nd Day—Almost filled in.
38. S. K.	54	M	W	Extremely painful swelling, (carbuncle) back of neck Duration 4 days	No discharge, skin extremely reddened indurated	1st Day—Wet dressings 30 min. every two hours. Ultra-violet irradiation for 10 minutes. Close application with special modified lamp. 4th Day—Painless, swelling considerably lessened. Wet dressings 3 x daily for 30 min. Ultra-violet for 15 min. 10th Day—Pain absent, slight residual induration. No further observation until three weeks later; stated that above lesion produced no further symptoms.

Examples of the Cases

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"Decrease in Convalescent Period and Probably* a Decrease in Scar Contractures

*The Use of Foille in the Treatment of Burns — Sidney Galt, M.D. Dallas Co. Med. Journ. XXV: 81 July, 1939.

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